DICTIONARY OF BOTANY

MADHU ARORA

DICTONARY OF BOTANY

DICTONARY OF BOTANY

DICTIONARY
OF
BOTANY

Mrs Madhu Arora
M.Sc. Ph. D.

S. C. E. R. T. We
Library
Calcutta

1989

ANMOL PUBLICATIONS
NEW DELHI-India

© *Reserved*

First Edition . 1987
Reprint : 1989

Published by
ANMOL Publications
4378/4B Gali Murari Lal
Ansari Road
New Delhi
Phone 261597

S.C.E.R.T, W.B. LIBRARY
Date 30 10.98
Accn. No. 9753

Printed at :
MEHRA OFFSET PRESS
1979, Chandni Mahal
DELHI-110006
Phone No. 268574

PREFACE

This dictionary covers terms which have been carefully selected from all the major fields of pure and applied plant science, including taxonomy and classification, anatomy and morphology, physiology, biochemistry, cell biology, plant pathology, genetics, evolution and ecology. Bacteria and viruses have been included although neither would normally be classified in the plant kingdom. Justification for this lies in their considerable importance in plant ecology and pathology.

An attempt has been made to write the entries in a clear and lucid style to provide both straight forward definitions and invaluable background information. Line drawings have been included whenever the meaning of a word can be best understood by means of a diagram. The network of cross-references has been kept throughout this edition.

The dictionary will of value to students of botany and to naturalists, geographers and others studying or working in related fields.

The author is happy to give credit here to all those who had a hand in getting the dictionary into its present form and specially to put on record my great debt to Dr. G.R. Chhatwal, and Ms. Timmy Kay, University of Saskatechewan, Canada, for the care and interest they took in clearing up complex points so that they might be put in simple English.

In compiling a dictionary of this kind it becomes necessary to draw upon the work of many authorities and seek the advice of colleagues to all of whom the author is deeply indebted.

Finally the author expresses her sincere thanks to the Publishers and printer for printing this book promptly.

All comments from users on omissions or shortcomings will be most welcome.

Dated
July, 1987

Mrs. Madhu Arora
M.Sc. Ph.D.

A

A. A class of flowers having freely exposed nectar.

AB. A flower having partially connected nectar.

Ab—. Latin prefix which means 'from'.

Abaxial. Not on, pointing away from or facing away from the stem or main axis.

Aberrant. Different from normal.

Abiogenesis. The producing of living things from unliving material. as envisaged in the modern theory of the 'origin of life.

Abjection. The sending off of spores by the sporophore of a fungus.

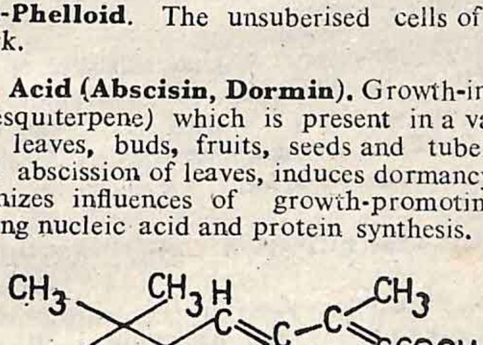
Abortion. (Of part of plant or animal) condition of being stopped in normal development.

Abrupt. Ending suddenly, as if cut off.

Abruptly Pinnate. (of leaves) Pinnate with no small leaf ending the stem, opposite odd pinnate,

Abscissa-Phelloid. The unsuberised cells of an abscission layer in the bark.

Abscisic Acid (Abscisin, Dormin). Growth-inhibiting plant hormone (a sesquiterpene) which is present in a variety of plant organs such as leaves, buds, fruits, seeds and tubers. Promotes senescence and abscission of leaves, induces dormancy in buds and seeds. Antagonizes influences of growth-promoting hormones. Acts by inhibiting nucleic acid and protein synthesis.



Abscission. Any natural process by which two parts become separate as the separating of a spore from a sporophyte.

Abscission Layer. Layer present at base of leaf-stalk in woody dicotyledons and gymnosperms, in which the parenchyma cells get separated from one another through dissolution of the middle lamella before there occurs leaf fall.

Absolute Transpiration. The rate of water loss from a plant which is determined experimentally.

Absorption Ratio. It is the ratio of the final internal concentration of a particular ion in plant tissue (*i*) to the final external concentration of a particular (*e*), *i.e.*, *i/e*.

Abstriction. A general term used for the release of a spore from its stalk, especially by constriction.

Acanaceous. Having sharp points.

Acantha. A sharp point.

Acarpellous. Having no carpels.

Acarpous. Producing no fruit.

Acaulescent. To describe plants which do not have stem or which have an extremely short stem such as tufted or rosette plants.

Acaulous, -ine, one. Having no true stem or only a very short one under the earth.

Accessory Bud. A bud which is present additional to the normal axillary bud.

Accessory Cell. A cell which is associated with the guard cell of a stoma, but is differing in structure from it and from the ordinary cells of the epidermis

Accessory Character. A characteristic of a species which is not essential to its diagonosis, but is sometimes employed to differentiate races.

Accessory Chromosome=Sex Chromosome.

Accessory Fructification. An asexual reproductive structure of lower plants.

Accessory Multiplication. Any asexual reproductive process.

Acessory Pigments. Pigments (*e.g.*, carotones, xanthophylls, chlorophylls *b*, *c*, and *d*, and the phycobilins) other than chlorophyll *a* found in photosynthetic cells.

Accesory Spore. An asexual spore.

Accessory Transfusion Tissue. Transfusion tissue which is extending through the mesophyll from the mid rib to the margins, found in certain gymnosperms, *e g.*, Cycas.

Acclimation. The adjustment ot a plant or animal to the different conditions of weather etc. in a new country.

Accrescent. Enlarged and persistent. Especially of a calyx which gets enlarged as the fruit ripens.

Accumbent. Touching something. specially of cotyledons having edges against radicle.

Acellular. (Of an organism), not divided into separate cells. Many organisms made up of one cell are quite complex in structure and in function and, in contrast to the term unicellular, 'acellular' means the biological equivalence of such organisms to the whole of a multicellular organism rather than to one of its cells.

Acentric. A piece of a chromosome or chromatid having no centromere.

Achephalous. Having no head. Said of a style having no well-developed stigma.

Acerose, Accrous. Needle-shaped.

Acervate. Heaped ; growth in heaps or groups.

Acervulus. A compact mass of hyphae which bear conidiophores and conidia. Formed by some parasistic ascomycets. The corresponding structure of saprophytic ascomycetes is termed as *sporodochium*.

Actabuliform. Saucer-like.

Acetaldehyde. CH_3CHO, an intermediate in the aerobic and anaerobic respiration of carbohydrates. Retards or inhibits germination and growth of some fungi.

Aceto-orcein. A stain which is used in the preparation of root tip or anther squashes for chromosome number.

Acetyl CoA, (Acetyl coenzyme A). A compound having acetyl combined through a sulphur bridge with coenzyme A. The formation of acetyl CoA is an energy-consuming reaction which involves the conversion of ATP to AMP and pyrophosphate. It is a degradation product of fatty acids, carbohydrates, and some amino acids.

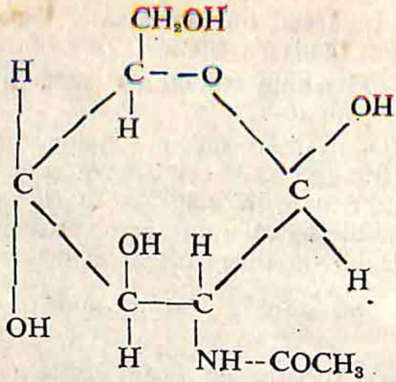
Acetylation. The formation of an acetyl radical from pyruvate during photosynthesis. The enzyme involved is co-enzyme A. The complete reaction may be put as follows :

$$(1)\ \underset{\text{Pyruvate}}{CH_3.CO.COO^-} + CoA + 2H_2O \longrightarrow$$

$$\underset{\text{Acetyl CoA}}{CH_3.COO.CoA} + HCO_3^- + H^+$$

(2) Acetyl CoA + oxalacetate $\longrightarrow$ citrate + CoA

N-Acetyl-2-Glucosamine. A glucose derivative, and the unit which gets repeated in the chitin molecule.



Acetyl-S-CoA. An intermediate, which is produced by co-enzyme A when it gets detached carbon dioxide from the α-keto-acid during respiration.

Achene. Small, dry, thin-coated one-seeded fruit, not bursting open, *e.g.*, butter cup, sycamore.

Achilary. Having no lip.

Achlamydeae. A division of the archiclamydeae having no petals and no sepals

Achlamydeous. Lacking perianth.

Achromatic. Having no colour.

Achromatic Spindle. (See 'Spindle'). In cell-division, a system of apparent fibres which does not get stained by basic dyes. They join the poles of the nucleus, and get diverged towards the centre of the cell.

Achromatin. The nuclear soap, which does not get stained with basic dyes.

Acicular. Refers to the needle shape *e.g.*, leaves of pine (Pinus) trees.

Acid dyes. Dyes having an acidic organic grouping of atoms (anion) which is the actively staining patr, combined with an inorganic cation, *e.g.*, eosin. These dyes stain cytoplasm and collagen.

Acme. The period of maximum vigour of an individual, race, or species.

Aconitrase. An enzyme which takes part in the Citric Acid Cycle (Kreb's Cycle). It dehydrates citrate forming *cis*-aconitrate, which is then converted to D-isocitrate, by the addition of a water molecule.

Acotyledon. A plant without cotyledons (said of the embryo of a higher plant).

Acquired Characteristics. The characters of an individual which get developed due to environmental conditions. According to the theory of acquired characters, these characters can be inherited.

Acquired Variation. A structural anomaly which becomes evident as the individual gets developed

Acrandrous. Possessing antheridia at the top of the stem, as in some mosses.

Acrocarpous. Fruit borne at the end of a branch.

Acrodromous. The veins of leaves run parallel to the edge of the leaf and meet at the tip.

Acrogamae. A division of the Angiospermae in which fertilization occurs through the micropyle (the usual way).

Acrogen. Any plant of the highest series of cryptogams, the archegoniatae.

Acropetal. Development of organs in succession towards apex, the oldest at base, youngest at tip, *e.g.* leaves on a shoot. Also used to indicate the direction of transport of substance with in a plant, *i.e.* towards the apex. Cf. ***Basipetal.***

Acroscopic. Facing in the direction of apex.

Acrospore. Spore at the and of hypha.

Acrostichoid Sorus. A fern sorus having several fused sori.

Actinomorphic. (of flowers), regular; capable of bisection vertically in two or more planes in to similar halves, *e.g.* buttercup. Also known as ***radially symmetrical,*** a term which is used to describe animals having a similar organization, e.g. jellyfish. C.f. ***Zygomorphic.***

Actinomycetales. A group of organisms which are intermediate between the bacteria and fungi. There is a fine mycelium which is not exceeding 1.5 μ in diameter and are Gram positive. Reproduce by fission, arthrospores, and/or conidia. The endospores are not formed, and sexual reproduction is not known. Some are responsible for diseases of plants and animals. Some, *e.g.* ***Streptomyces*** produce valuable antibiotics.

Actinodromous. Describing a form of leaf venation in which three or more veins are originating at the base of the lamina and running out towards the margin. For example, the leaves of sycamore (*Acer pseudoplatanus*).

Actionomorphy. See *radial symmetry.*

Actionomycetales. An order of bacteria having forms that develop a branched mycelium reminiscent of fungal growth forms though on a much smaller scale. Most are saprophytic while some are pathogenic.

Actinomycosis. Diseases of cows, sheep, pigs, sometimes taken by man caused by a fungus and marked by the producing of hard masses round the mouth.

Actinostele. A protostele which is stellate in cross-section, having the protoxylem at the tips of the star. A primitive type of stele occurred in the early Pteridophytes.

Action Spectrum. Gives the relation between the amount of photosynthetic activity for an equal amount of light and the wavelength of the light.

Active Centre (site). The part of an enzyme molecule that undergoes combination with the substrate. A relatively small number of the atoms of the enzyme molecule gets involved.

Active Transport. Transfer of substance from region of low concentration to where it is high especially across a membrane; takes place by expenditure of energy from metabolism. Probably all cells can do this.

Acuminate. Said of a condition of gradual narrowing to a point in a structure as in certain leaf tips.

Acute. Said of a condition in which structure ends into a sharp point but is not extending as in the leaf tip of certain leaves.

Acyl Carrier Protein (ACP). A low molecular weight conjugated protein which forms a complex with the enzymes of fatty acid synthesis and binds the acyl group of the growing fatty acid molecule, thereby bringing enzymes and substrate together.

Adaptation. Adjustment of an organism to its environment so that it becomes better fitted for a particular environment. Adaptation may either be acquired during the life of an individual or if governed by the genotype, be inherited,

Adaptive Enzyme. An enzyme formed by an organism especially by bacteria in response to growing on an substrate, *i.e.* the enzyme is not normally present, but develops soon after growth on the new substrate has started, so that it can be used.

Adaptor compound. A carrier compound, *e.g.*, RNA, which is responsible for transferring a substance to the site of reaction.

Adaxial. The surface generally of a leaf, facing the stem. Next to the axis.

Adcrustation. The deposition of a substance on a cell-wall, instead of being laid down between the existing molecules. This latter process is termed as encrusting.

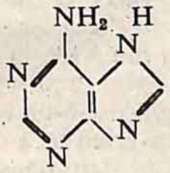
Additive Fixative. A fixative that undergoes chemical combination with the protein of the material to be preserved.

Adeciduate. Not dediduous.

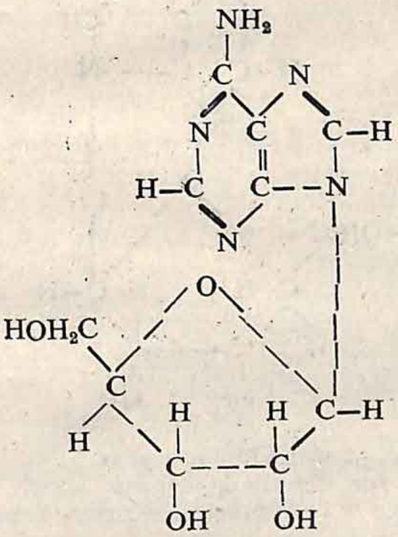
Adelphogamy. Union between a vegetative mother-cell and one of its daughter cells.

Adelphous. Used for androecium in which the filaments are fused. Also see monoadelphous, diadelphous, polyadelphous.

Adenine. A nitrogenous base. Chemically, it is 6-aminopurine. Reacts with the sugar ribose to form the nucleoside adenosine. It occurs in RNA, DNA, ATP, ADP, and AMP. It is found in beet-juice, and tea-leaves. It also promotes bacterial growth. Many cytokinins are derivatives of adenine ; itself shows cytokinin activity.



Adenosine. A nucleoside obtained by the combination of adenine with a ribose sugar, and yielding the nucleotide adenylic acid, one of the nucleic acids.

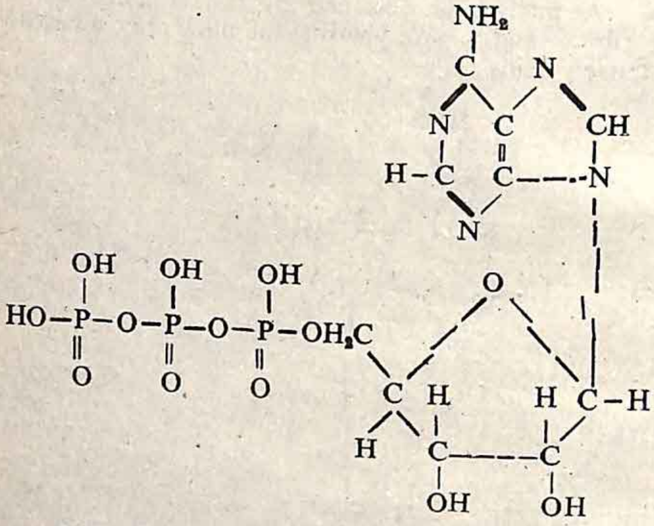


Adenosine Diphosphate (ADP). The diphosphate ester of adenosive. It is closely related to adenosine triphosphate in the transfer of energy through 'high energy' bonds during the respiration of carbohydrates. The energy gets released in the production of ester phosphates by the ADP, which is acting as a phosphorylating agent.

Adenosine Monophosphate. A phosphorylated nucleoside having the purine adenine and the sugar ribose phosphorylated in

5′ position. It takes part in the regulation of glycolysis and gluconeogenesis, thereby promoting the formation of fructose biphosphate from fructose-6-phosphate (*i.e.*, promoting glycolysis) while inhibiting the back reaction to fructose biphosphate.

Adenosine Triphosphate (ATP). The triphosphate ester of adenosine which occurs in mitochondria. Two of the phosphate radicals are having 'high energy' links of the pyrophosphate type (P-O-P) which get changed to 'low energy' links during the formation of ester phosphates by the ATP. Thus, energy is liberated during phosphorylation. **ATP** also acts as a phosphate donor, as in converting glucose to glucose-6-phosphate. It is essential before glucose can further get converted to a disaccharide, or polysaccharide. Glucose + ATP → Glucose-6-phosphate + ADP.



Adhesion. The union of dissimilar organs.

Adnnate. Used for describing organs which are joined together *e.g.*, stamens fused with the petals. Compare conate.

ADP. Adenosine diphosphate.

Aduncate. Hooked.

Adventitious. Used for describing organs which are arising in unexpected position, *e.g.*, roots growing from a leaf.

Adventive. Net being or having become natural to a place, said of plants taken from other places.

Adventive Embryo (Adventitious embryogenesis). The formation of an embryo in some position other than within an embryo sac.

Aeciospore. *See aeciopore.*

Aeciospore. A dikaryotic spore which is formed by certain rust fungi in a small cup-shaped srous, the aecium or aecidium, *e.g. Puccinia graminie.*

Aecium. A glabular, cup-shaped, tubular or irregular fungus fruit body which gets bursted through the epidermis of the host. Typically it has surrounding sterile fungus membrane—the periderm which encloses the fertile portion which produces chains of aeciospores. Typically of the Rust fungi.

Aerating Root. A root of some plants which grows in soft mud. They have aerenchyma, and stand above the surface of the ground actng as ventilating organs.

Aeration Tissue. *See Aerenchyma.*

Aerenchyma. A tissue of unthickened cells which are surrounding large airspaces. The walls formed by the cells are perfora ted so that the airspaces become continuous throughout the organ. This type of tissue is common in hydrophytes.

Aerolae. Used for cracks which get developed in the surface of a crustaceous lichen due to growth strains. These cracks help in aeration.

Aerial Plant. See epiphyte.

Aerial Root. A root which is usually arising adventitiously from a stem. Usually it is climbing organ, but may contain chlorophyll, or form a parasitic sucker, thus aiding in nutrition.

Aerobe, Aerobiont. A plant which is needing elemental oxygen for respiration.

Aerobic Respiration. Enzymatic destruction of a substrate to release energy, involving elemental oxygen, evolving carbon dioxide and water. Starting material for respiration is glucose which on complete oxidation, yields approximately 700 kcal (38 molecules of ATP) of net energy in aerobic respiration in which 6 molecules of oxygen are consumed and 6 molecules of carbondioxide and water each are evolved. *Compare* anaerobic respiration.

Aerophore. See *pneumatophore.*

Aerotaxis. Chemotactic movement in which cell or an organism shows movement in response to stimulus of oxygen.

Aerotropism. Chemotropic movement shown in response to stimulus of oxygen.

Aestivation (*Prefloration*). Used for the arrangement of sepals in calyx, petals in corolla or tapels in perianth whorls in immature condition in a bud. There are different types of aestivations on the basis of the pattern of overlap of units in a whorl. (Fig. 1).

After Ripening. (1) A period through which some seeds have to pass after ripening, before they get germinated.

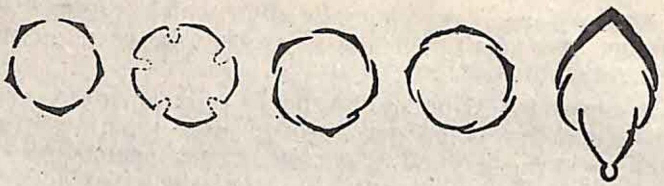


Fig. 1. Different types of Aestivation.

(2) The chemical and physical changes taking place inside a seed or other dormant plant-structure, thereby leading to the development of conditions when growth can commence.

Agamandroecious. Male and neuter flowers persent in the same inflorescence.

Agamogyroecious. Female and neuter flowers present in the same inflorescence.

Agamohermaphrodite. Hermaphrodite and neuter flowers pirsent in the same inflorescence.

Agmospermy. The formation of seeds without the fusion of gametes.

Agamotropic. Used for a flower which does not shut after having once opened.

Agar. A mucilaginous substance obtained from certain red algae, mainly *Gelidium.* It is a carbohydrate and used in the form of gel as a microbiological supporting medium.

Age and Area, Theory of. According to this theory, the areas of distribution of the members of a group of allied species are correlated with their ages as species in any given region.

Aggregate Fruit. A fruit-like structure which is developed from many free carpels of a single flower (apocarpous gynoecium). It consists of a number of separate fruits. It may be an aggregate of achenes, berries, drupelets, follicles or samaras.

Agrestal, Vgrestis (latin). Growing in cultivated land, but not itself cultivated, *e.g.* a weed.

Air Bladder. 1. A swollen air-filled portion of thallus which occurs in many members of the order Fucales of brown algae. They increase buoyancy and help in gaseous exchange.

2. Any air-filled protuberance which is developing in pollen grains of cretain gymnosperms due to separation of the layers of exine *e.g.*, in pollens of *Pinus*. Such structures give characteristic winged appearance to the pollen and assist in dispersal of pollen by wind.

Air Cavity, Air Space. (1) Used for a large intercellular space in a leaf into which a stoma is opening.

(2) A cavity in the upper surface of the thallus of some liverworts which is opening externally by an air-pore and containing chains of photosynthetic cells.

(3) A large intercellular space in which air is sotred in some water-plants.

Air Chamber. Used for air-filled cavities which are present beneath upper epidermis in gametophytic thallus of many liverworts of order Marchantiales.

Air Layering. A method of vegetative propagation used in greenhouse and indoor plants by stimulating root production in a branch while it still remains attached to the parent plant. A shallow cut is made or narrow ring of bark is removed just below the bud. Cut is made to dust with powder having synthetic, root-promoting auxins and is covered with *Sphagnum* moss and kept moist surrounded by a plastic sleeve. Root formation is slow and may sometimes take upto two years.

Akaryote. Describing the stage in the nuclear cycle of the Plasmodiophoraceae, before meiosis in which little or no chromatin is visible in the nucleus. Sometimes applicable to the same stage in the life-cycle of any lower plant.

Akinete. A thick-walled, non-motile spore, having oil or other food reserves. It is formed singly within a cell, with the spore wall which is indistinct from the cell-wall.

Alanine. $CH_3CH(NH_2)\ COOH$. An amino acid which occurs in combination with proteins.

Alate. Winged ; applicable to stems when decurrent leaves are present.

Albumen. An obsolete name for the endosperm.

Albumins. A group of simple proetins. These are soluble in water, and get coagulated by heat.

Albuminoids. A general term used for proteins.

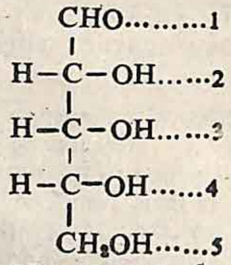
Albuminous Cell. A cell which is rich in contents and associated with the phloem in the stems and leaves of some Gymnosperms, and possibly conducting proteins.

Alburnum. An obsolete term for sap-wood.

Alcoholic Fermentation. The process of the formation of various alcohols during the anaerobic respiration of carbohydrates by various microorganisms. An example is the production of ethyl alcohol by yeasts fermenting sugar present in malt, during brewing.

$$\underset{\text{Sugar}}{C_6H_{12}O_6} \rightarrow \underset{\text{Ethyl alcohol}}{2C_2H_5OH} + \underset{\text{Carbon dioxide}}{2CO_2}$$

Aldose. A monosaccharide sugar which is having an aldehyde (CHO) group in the first position, and a CHOH group in the second position. *e.g.*



$$\begin{array}{l} \quad\;\; CHO \ldots\ldots 1 \\ \qquad | \\ H-C-OH \ldots\ldots 2 \\ \qquad | \\ H-C-OH \ldots\ldots 3 \\ \qquad | \\ H-C-OH \ldots\ldots 4 \\ \qquad | \\ \quad\;\; CH_2OH \ldots\ldots 5 \end{array}$$

D-Ribose (an aldopentose)

Aleppo Gall. A tumourous growth taking place on various Oak species. It has gallic acid, and gallitannic acid. Extract finds use in tanning leather.

Aleuriospore. A terminal, thick-walled spore. It is formed from the end of a hypha, from which it gets separated by a cross-wall.

Aleurone Grains. Granules of protein occur in cells. These cells often form a distinct layer called the aleurone layer, *e.g.* in the endosperm of Maize.

Aleurone Layer (*Proteinaceous endosperm layer*). The proteinaceous outermost layer of endosperm which is found in seeds of Graminae and Polygonaceae. The cells of this layer have ***aleurone grains*** which store protein to be used at a later stage by the developing embryo.

Algae. A division of the Thallophyta, which includes all the holophytic members. All are aquatic, or sub-aquatic, and vary from the unicellular types to the large seaweeds. They lack any vascular tissue, and are not differentiated into stem, root, and leaf. The reproductive organs are essentially one-celled, and the gametes are mostly flagellate.

Algin. The magnesium-calcium salt of alginic acid which occurs in inner cell-wall of the Brown Algae. It finds use commercially in the manufacture of confectionary and to some extent in the manufacture of man-made fibres.

Alien. A plant which has been introduced by man, and then naturalized.

Alginic Acid. A carbohydrate polymer which is made up of D-mannuronic acid and L-glucuronic acid units. It occurs mainly in cell walls of brown algae where it functions as agent of ion exchange.

Alkaline Soil. A soil having alkaline pH. It is formed in areas of very high rainfall or dryness due to deposition of calcium salts in surface layers or on the soil. *See pedocal.*

Alkaloids. Used for cyclic vegetable-bases, with a heterocyclic ring, and having nitrogen. They cause a physoloigical effect on animals, *e.g.* morphine, and atropine. Sometimes include nitrogen bases which are not having a heterocyclic ring, *e.g.* caffeine.

Allele, Allelomorph, Allelomorphic Gene. Different forms of a gene, which have the same locus on homologous charomosomes, and are subject to Mendelian (alternative) inheritance.

Allelism. The relationship between alleles.

Allelopathy. Releasing of some chemical by a plant into its surroundings which has been found to inhibit the growth of nearby plants. An example is that pine produces substances killing seedlings of same species growing near to the parent plant (autoallelopathy). Another example is the secretion of HCN by bitter almonds which inhibits seed germination of poppy.

Allocarpy. When fruiting takes place after cross-fertilization.

Allochronic Speciation. The formation of new species during the passage of time, tending to form a gradation from one species to the next.

Allogamy (*Cross fertilisation, exogamy*). Used for the fusion of male and female gametes which are derived from two genetically different individuals of the same species.

Allometric Growth. Used for describing growth rate of a part of an organism to that of whole organism. All parts of an organism rarely grow with same rate of growth. Parts growing faster than the whole organism are said to exhibit *positive allometry*. Parts growing slower than the whole organism are said to exhibit *negative allometry*.

Allopatric Speciation. The formation of new species over a length of time, by the geographical isolation of groups of the common ancestor, *e.g.* by a mountain range.

Allopatry. Describing a population or species where two groups of isolated organisms can not breed with each other due to their separation by distance or natural barriers *e.g.*, water, deserts or mountain range. Population distributed in such a way (*allopatric*) may develop different adaptations of different habitats and then they may fail to interbreed even if barriers are broken (*allopatric speciation*).

Allophilic. Used for flowers of an insect pollinated species that can be pollinated by different types of insects.

Allopolyploidy. An artificial polyploid which is formed by the hybridization of different species, *i.e.* the individual is having two or more sets of chromosomes, which have different chromosome compliments.

Allosome. See *Sex chromosome.* Any chromosome other than a typical one.

Allosomal Inheritance. Inheritance of characters which are carried on an allosome.

Allosteric Enzyme. A regulatory enzyme responsive to changes in metabolic state of the cell or tissue. Its catalytic activity could be modified by noncovalent binding of a specific metabolite at a site other than the enzyme active site. The most common example of such enzymes is the first enzyme of some enzyme sequences which gets inhibited specifically by the end product of reaction sequence (*feedback inhibition*). Activity of allosteric enzyme could be increased also by an allosteric modulator. Allosteric enzymes may be having more than one allosteric modulator also. Reactions involving allosteric enzymes are always irreversible.

Allosteric Site. A regulatory site on an allosteric enzyme which can reversibly undergo binding with a specific effecto or modulator. When bound to enzyme, modulator either inhibits (negative modulator) or activates (positive modulator) the enzyme by changing its shape. Some allosteric enzymes are having a site only for one modulator (*monovaleut enzymes*) while others are having several allosteric sites (*polyvalent enzymes*).

Allosyndesis. (1) Used for the pairing in a cross of two polyploids, or of chromosomes derived from opposite parents.

(2) Pairing in an allopolyploid between chromosomes which are derived from ultimate diploid ancestors, opposed to autosyndesis.

Allotetraploid. An allopolyploid which is formed by the doubling of the chromosome number in a diploid hybrid ; *i.e.* a tetraploid having a diploid set of chromosomes from each parent.

Allotropous Flower. A flower which has the nectar freely-exposed and available to a wide variety of insects.

Allotype. One of the original types for describing a new species.

Alluvial Soil. A soil which is derived from marine, esturine, or river deposits. A young soil, with an undeveloped profile. Usually has a high fertility.

Alpha-Ketoglutarate Oxidase. An enzyme in the Citric Acid Cycle (Kreb's Cycle), which oxidises α-ketoglutarate to succinic acid, by oxidative decarboxylation.

Alpine. A major biome (regional plant community) in high mountaineous regions and on high level pleateaus. Plants growing in this stony soil are subjected to high wind and high light intensity. Certain drought resistant species *e.g.*, grasses, sedges, mosses and lichens are common.

Alternate. Used for describing arrangement of leaves on stem in which one leave arises simply at each node. It is a common pattern in plants. *Compare opposite, whorled.*

Alternate Host. The host other that the main host of a pathogen on which it can survive in case the main host is not available. The term can also be used if a pathogen is having more than one host.

Alternation of Generations. Describing the alternate production of independent haploid sexual, and diploid asexual, generations in a life-cycle. This may be further complicated in some Algae and Fungi. If the two generations look alike, the alternation is *homologous*, and if they do not look alike, the alternation is *antithetic.*

Alternative Host. One of the hosts of a plant pathogen, usually referred to the wild host(s) of a disease-causing organism of a cultivated plant.

Alterne. A sudden change in a plant species which is spread over a wide area. Such a change is brought about by variation in the soil or other environmental conditions.

Alveole Alveolus. (1) A small surface pit.

(2) A pore of a polyporous fungus.

Ameiosis. Having one division (instead of two) of the nucleus at meiosis, so that the chromosome number of the mother-cell does not get reduced.

A mensalism. Used for describing association between two different types or organisms in which one organism harms the other by its activities but does not get any benefit by such activity.

Amino Acid. A derivative of acetic acid in which one hydrogen of the alkyl group has been replaced by an NH_2 group. For example $CH_3.COOH$ is acetic acid while $CH_2.NH_2.COOH$ is amino-acetic acid (glycine). The substitution of a second hydrogen by one of a number of side-chains yields a series of amino acids, *e.g.* $CH_2NH_2.CH_2COOH$, is alanine. Amino acids being synthesized by autotrophic plants and ultimately are built up into proteins.

Amino Acid Sequencing. Means the determination of the sequence of amino acids in a protein. Sequencing of homologous proteins from different species finds use in determining the phylogenies. It is assumed that number of differences in sequence may be related to the length of time because different species get diverged from their common ancestor.

Amino Sugar. A monosaccharide which has amino group in place of one of the OH groups. Glucosamine and galactosamine are most commonly occurring amino sugars. Amino sugars are components of glycoproteins.

Amitosis. Used for the division of the nucleus by a median constriction, without a normal mitosis taking place. The chromosomes do not become visible, and it is unlikely that two identical nuclei result.

Ammonifiers. Used for the decomposition of nitrogenous, organic substances to produce ammonia.

Ammonification. Bacteria {which are capable of liberating ammonia from proteins, or protein derivatives.

Ammonisation=ammonification. Applied especially to bacteria which are producing nitrogenous substances in the soil.

Amoeboid. Resembling an amoeba lacking cell-wall, or fixed form ; creeping, and putting out pseudopodia.

AMP=Adenosine monophosphate.

Amphiclinous Progeny, Amphiclinons Hybrid. A family which results from a cross, and having some of the offspring resembling one parent, and some the other.

Amphicribral Bundle. A vascular bundle in which the phloem is surrounding a central strand of xylem.

Amphidiploid=Allotetrpaloid.

Amphigastrium. The lower leaves of a leafy liverwort which are always inserted transversely.

Amphikaryon. A nucleus having two haploid sets of chromosomes. Abnormal diploid nucleus.

Amphilepsis. Inheritance of characteristics from both parents.

Amphimixis. The fusion of two distinct cells and nuclei, *e.g.* antheridium and archegonium, resulting in the formation of a new individual.

Amphiplexicaul. Used for describing a sessile leaf in which laminar base clasps the stem at the node.

Amphiphloic. Used for describing condition in which phloem is present on both sides of xylem as in a solenostele.

Amphiphloic siphonostele. See *Solenostele.*

Amphisphaeriaceae. A family of the Sphaeriales, distinguished by the circular opening of the perithecium.

Amphispore. A thick-walled uredospore which is produced under dry conditions by some Uredinales, and get germinated after a resting period.

Amphitene. The stage in meiosis when the spireme threads get united in pairs.

Amphithecium. (1) The outer layer of the embryo of the Bryophytes which is derived early by the periclinal division of the cell.

(2) The thalline margin of a lichen apothecium.

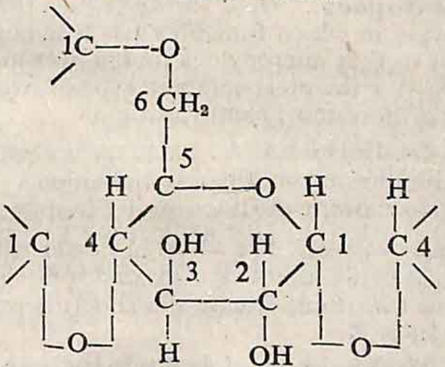
Amphitrichous. Having a flagellum at each end of the cell.

Amphitropous. Of an ovule which is bending both ways on the stalk.

Amphivasal Bundle. A vascular bundle in which the xylem is surrounding the central strand of phloem.

Amylase. An enzyme which is responsible for the break-down of starch; part of the diastase complex. β-Amylase attacks the amylose part of the starch molecule, breaking it down to maltose. α-Amylose attacks the remaining part of the molecule, and any amyalse breaking it down to dextrins (5-10 glucose units), which get further attacked by the β-amylase. Only the 1 : 4 linkages in the amylose, and amylopectin get attacked by these two enzymes.

Amylopectin. A polysaccharide which is made up of branched chains having a large number of glucose units linked in the 1 : 4 or 1 : 6 position. It is a constituent of most starches.



The linkage forming amylopectin from glucose units.

Amyloplast. A colourless plastid which is modified for starch storage as in the potato.

Amylose. A long straight-chained polysaccharide, which is made up of about 300 glucose units linked in the 1 : 4 position (see *amylopectin*). It is a constituent of starch, and is responsible for the typical blue colour of starches when treated with iodine solution.

Amylum. *See starch.*

Anabolism. Used for the formation of complex molecules from simple ones by living organisms. This process involves the storage of energy.

Anaerobic Respiration. Used for describing the enzymatic breakdown of a subsrtate releasing energy, without using oxygen. The anaerobic respiration of a given weight of a substrate gives out less energy than the aerobic respiration of the same weight of the same substrate. Facultative anaerobes can use free oxygen, obligate anaerobes do not. See *alcoholic fermentation*.

Anagenesis. Used for describing the rate or degree of evolutionary divergence.

Analogous. Used for structures which have the same appearance or function, but are not necessarily homologous.

Anandrous. Without stamens.

Anaphase. Used for the stage during mitosis or meiosis when the centromeres divide, so that each chromatid possesses its own centromere. The chromotids then migrate along the spindle to opposite poles. Anaphase ends when the chromosomes are formed into two groups at the opposite poles of the spindle.

Anaphysis. A sterigma-like thread in the apothecium of some lichens.

Anatomy. Dealing with the study of structure and distribution of tissues alongwith the study of their component cells inside the body of an organism. *Compare morphology.*

Anatropous. Used for describing the form of ovule orientation in ovary in which funiculus gets lengthened and ovule is turned 180° on it so that micropyle is folded over and lies near the base of funiculus. It is the most common type of ovule orientation in plants. *Compare* orthoropous; campylotropous.

Androdioecious. A plant species which has male and hermaphrodite flowers on separate individuals as in *Caltha*. *Compare* andromonoecious, gynodioecious.

Androecium. The whorl in flower which forms male component. It is made up of stamens and sometimes, staminodes, surrounding the innermost female whorl. It is represented in floral formula by letter A.

Androgynophore (*Androphore*). Used for describing an extension of receptacle of flower between petals and stamens, on which the androecium and gynoecium are borne *e.g.*, in members of Capparaceae.

Androgynous. (1) Having stamens and ovraies present in distinct parts of the same inflorescence.

(*ii*) Having male and female organs on, or in the same branch of the thallus.

Andromonoecious. Of an individual plant or of a species having individuals which bear male and hermaphrodite flowers on the same plant.

Androphore. An elongation of the receptacle of a flower between the corolla and the stamens.

Androsporangium. A sporangium which is producing the androspores.

Androspore. A special form of zoospore which is produced by the Oedogoniales. It gets germinated to form the dwarf male filament.

Anemochorous. Used for plants whose fruits or seeds get dispersed by wind; especially plants which retain their seeds or fruit throughout the winter, ready for dispersal in the spring.

Anemophilous. Having seeds, pollen spores etc. which are dispersed by wind.

Anergized Cultures. Used for long-estabished cultures which become able to synthesize auxins and thus become independent of their exogenous supply.

Aneuploid. A polyploid in which some of the chromosomes of one set are missing, so that the chromosome number is not an exact multiple of the haploid number, *i.e.* an unbalanced polyploid. *See euploid.*

Aneurin. A vitamin which probably promotes root-growth. A growth factor for some fungi and bacteria.

Aneuspory. Said of production of unusual number of spores (usually two) from a spore mother cell in a diploid plant through a modification of meiosis. In megaspore formation in *Taraxacum*, chromosomes stay in one cell after undergoing first meiotic division so as to form a *restitution nucleus.* Second meiotic division results in two cells each with unreduced number of chromosomes. One of them develops parthenogentically to yield embryo. Crossing over and hence reassortment of genes may take place during first meiotic division which may result in some of the variation found in apomictic complexes that have arisen by aneuspory.

Angiospermae. A class (sub-division) of the Spermatophyta. It is characterized by the ovules (female gameophytes) completely enclosed in an ovary which forms part of the flower, and swells at maturity to give rise to the fruit. The pollen-grains (male gametophy) tes are produced in anthers. Typically the xylem is having vessels.

Anisogamy. Used for decribing sexual reproduction involving two gametes which are similar in shape and structure but differ in size and/or motility. *Compare isogamy, oogamy.*

Annealing. *See renaturation.*

Annual. A plant which completes its life-cycle in a single season, *i.e.*, a seed germinates and the mature plant so produced dies after having produced seeds, within the season.

Annual ring. The increment of secondary xylem added to wood of a plant in a single year. In transverse section of wood one or more rings often appears, due to seasonal differences in diameter of tracheary elements. *See also growth rings, ring porous wood*.

Annular thickening. The laying down of lignin in separate rings in the walls of xylem vessels and tracheids.

Annulate. (1) Ringed. Made up of ringed segments, or thickened in rings.

(2) Having a membranous ring which is persent on the stipe (of Agarics).

Annulus. (1) The ring of tissue which is found around the inside of the top of a moss capsule. The cells below it dry out, causing the lid to fall off, and allowing the spores to get dispersed.

(2) An arc of cells which is found around the sporangium of a fern. The outer walls of the cells are not thickened, so that when the cells dry out, tensions are set-up which burst open the sporangium.

(3) The ring-like remains of the veil left on the stipe after the expansion of the pileus of some Agarics.

(4) A ring of cells present around a bulbil. It takes part in the vegetative reproduction of some fungi.

Anomocytic. *See subsidiary cell*.

Anther. The part of the flower of Angiosperms which is producing pollen (microspores), borne at the end of the stamens, and usually having four sporangia.

Anther Culture. Said of the culture of excised anthers on a suitable nutritive medium. Embryoids and subsequently haploid plants can be formed if anthers at a certain stage of development are taken and then cultured under appropriate condition of medium etc.

Antheridial Cell. Occurring in bryophytes and pteridophytes. A cell which is developing into an atheridium.

Antheridial Chamber. The cavity in a thallus having an antheridium.

Antheridial Filament. A filament which is developing in the capitulum of the Charales. When it gets matured, each cell of the filament develops in antheridium, and produces a single antherozoid.

Antheridiophore, Antheridial Receptacle. (*i*) A special male branch which is found in some of the Marchanitales.

(*ii*) A special branch which is bearing one or more antheridia.

Antheridium, Antherid. The male sex-organ of the lower plants which is producing antherozoids (microgametes). The antherozoids are usually motile, but in some of the Phycomycetes, the antheridium contacts the oogonium (female sex-organ) into which it produces a fertilization tube, and through which the cell contents of the antheridium pass, thereby causing the fusion of male and female nuclei.

Antherocyte (spermatocyte). A cell which gets differentiated into an antherozoid without undergoing further cell division. Antherozoid is usually released from antherocyte after its liberation from antheidium.

Antherozoid. A small motile male gamete having flagella, and produced in an atheridium.

Anthesis. (*i*) The opening of a flower-bud.

(*ii*) The duration of life of a flower from the opening of the bud, to setting of the fruit.

Anthochlor pigment. Describing a group of yellow flavonoid pigment having chalcones and aurones. These turn red when exposed to ammonia while other yellow carotenoids do not show this reaction.

Anthocyanescence. Used for the development of red pigments as a disease symptom *e.g.*, seen in peach leaf curl which is caused by fungus *Taphrina deformans*.

Anthocyanin. Describing any of the glycosidic pigments formed by addition of sugars and other residues to an anthocyanidin precursor (usually pelargonidin, delphinidin or cynidin). All of these are either red, blue or violet. These are sap soluble, occurring in cell sap of flower, fruits, stems and leaves.

Anthoxanthin. Describing any of the yellow or cream coloured glycoside plant pigments which normally consist of a glucose molecule attached to a flavone or xanthone molecule.

Anthracnose. A fungal plant disease which is characterized by limited lesions, necrosis and hypoplasia and is generally caused by members of Melanoconiales *e.g.*, *Colletotrichum linodemuthianum*, *C. coffeanum* etc. Fungal spores get spread by rains and infection requires high humidity and destruction becomes maximum when tissues become water soaked. Symptoms also include scab, leaf-spot and blight (which are not exclusive to the group).

Antibiosis. Antagonism between two organisms resulting in one overcoming the other, or, at least, to the detriment of one of them.

Antibiotic. Any substance damaging to life, but especially a substance produced by micro-organisum damaging or killing, other micro-organisms, or higher plants. The term is usually limited to substances of medical importance, *e.g.* Penicillin, Streptomycin etc.

Antibody. Immunogloblin which is a 4-chain protein molecule of specific amino acid sequence produced by lymph nodes of the body. It is released in blood serum in response to the presence of some foerign body. The antibodies are specific to invading

S.C.E.R.T., W.B. LIBRARY
Date 30.10.98
Accn. No 9753.

bodies and are produced for combating and neutralising the invading body.

Anticlinal. Used for describing position at right angle to the surface (generally the periphery of a circle). Anticlinal wall of a cell is perpendicular to the surface of the plant body and anticlinal division forms anticlinal walls between daughter cells and causes increase in circumference alongwith increasing girth of the organ. In cylindrical organs *e.g.* stems and roots, term radial may be employed in its place especially in description of cell walls. *Compare* the periclinal.

Anticodon. A sequence of 3 nucleotides on tRNA which are complementary to a sequence of 3 nucleotides on mRNA (codon). It gets binded to codon on mRNA temporarily during protein synthesis. A tRNA molecule has specific anticodon which only complexes with one particular amino acid. This absolute correspondence between an amino acid, an anticodon and a codon has been found to determine precise amino acid sequence in a protein.

Antigen. Any invading foreign material in the body. It induces immune mechanism of body for producing specific antibody in the blood serum which cambats and neutralizes this invading material.

Antipetalous. Said of the position of stamens which are inserted opposite to petals.

Antipodal Cells. The haploid cells which are usually 3 in number and present in embryo sac at the opposite and of micropyle They are derived by mitotic division in megaspore and lacking definite cell wall. Their function is not known. At fertilisation, they may disintegrate or multiply and enlarge.

Antisepalous. Said of the position of stamens which are inserted opposite to sepals.

Antithetic. *See heteromorphic.*

Antitranspirant. Any chemical substance which causes redution in transpiration either by closing stoma or forming a film over the stomata. They also reduce photosynthesls and influence other metabolic activities also.

Aperturate. Said of a pollen grain which is having one or more apertures. If apertures are colpi, pollen is known as *colpate* and if pores, *porate.*

Aphid. Used for describing an insect of family Aphidaceae of order Hemiptera. These are small plant bugs living by sucking plant juices. Many are pests themselves where as others become important as vectors of plant viral diseases *e.g.* CMV.

Apical Cap. Rings on the lateral walls, at the distal ends of the cells in the filament of some of the Oedogoniales.

Apical Cell. (1) The single meristematic cell which is present at the tips of the branches of the thallus of the more complex Algae.

(2) The meristematic cell present at the tip of a bryophyte thallus. It gives rise to new tissue by division, but may give rise to two apical cell thereby initiating the dichotomy of the thallus.

(3) The single meristematic cell present at the tip of root and shoot branches of the Pteridophyta.

Apical Cell Theory. According to this theory the tissues of higher plants are developed from a single cell. It has been disproved by studying the complex apices of the Gymnosperms.

Apical Dominance. Used for describing inhibitory influence of apical bud on some or all the lateral buds present in a plant shoot. Removal of apical bud releases lateral buds from apical dominance which most probable involves auxins for its effect. It becomes less marked when nutrients are in plenty.

Apical Growth. The elongation of a filament of the Thallophyta by involving growth at the apex only.

Apical Meristem. The group of actively dividing cells which are found at, or near the tip of a stem, root or sometimes, a leaf. It originates from a single cell in the Pteridophytes, and form a group of cells in the Spermatophyta. It causes an increase in length by forming the primary plant-body.

Apical Placentation. (Pendulous placentation, suspended placentation). Used for describing a form of placentation found in ovaries having only one ovule and placenta are developing at the top of the ovary.

Apiculate. Used for describing structure which has a small broad point at the apex.

Aplanetic. Used for describing organisms that lack any motile stage in their life cycle.

Aplanospore. A non-motile spore, having its wall free from the wall of the cell in which it was formed.

Apocarpous. Used for describing gynoecium in which all carpels of gynoecium are free. Such condition is considered to be primitive than syncarpous condition. *Compare syncarpous*

Apoenzyme. The catalytically inactive protein portion of an enzyme which renains after removal of prosthetic group or cofactor. Examples of enzymes requiring both apoenzyme and cofactor for catalytic activity are alcohol dehydrogenase requiring Zn^{2+}. kinases requiring Mg^{2+} or Mn^{2+} and cytochromes requiring Fe^{2+}. See also holoenzyme.

Apogamy. Reproduction without involving the fusion of gametes, and generally without meiosis. The term may include any form of vegetative reproduction.

Apogeny. Sterility.

Apomict. An organism reproducing by apomixis. It may be *facultative apomict* (*e.g. Potentilla*) which can reproduce both sexually or apomictically and the incidence of apomixis may be influenced by environmental conditions such as photoperiod. Obligate *apomict* reproduces only by apomixis and are often triploid or pentaploid and thus fail to form viable pollens.

Apomixis. Used for describing any form of asexual reproduction including vegetative reproduction.

Apomorphy. Used for describing the character state in phylogenetic studies or cladistics which is considered to be derived or advanced. Apomorphies shared by different taxa are known as *synapomorphies* (*Compare* autapomorphy). Only those synapomorphies whose origin could be traced back to a recent common ancestor find use in constructing phylogenies or cladograms. Analogous synapomorphies which are arising be convergent evolution, if identified are not taken into account. *Compare pleisomorphy.*

Apopetalous. (*i*) Having many petals.

(*ii*) Sometimes employed in exactly the opposite sense, *i.e.* having no petals.

Apophysis. (*i*) The sterile tissue present at the base of a moss capsule.

(*ii*) The enlargement of the distal end of a scale of a pine cone.

(*iii*) A swelling, or swollen hypha of a fungus.

Apoplasmodial. Of Acrasiales, hvaing non-fusion of the myxamoebae.

Apoplast. The complex made-up of the xylem cell-wall, and the cellulose wall and contetns of the adjoining cell, through which water, salts etc. have to pass before they reach the other tissues of the plant.

Aporogamy. Used for describing the penetration of the ovule by the pollen-tube, by some other path than the micropyle.

Apospory. The production of a diploid gametophyte from the sporophyte due to the absence of meiosis.

Apothecium. The fructfication of some Ascomycetes which gets flattened or cup-shaped having the asci on the upper surface in a palisade-like layer, usually mixed with sterile hyphae. It is termed as *angiocarpic* if it is closed before maturity, and *gymnocarpic* if open.

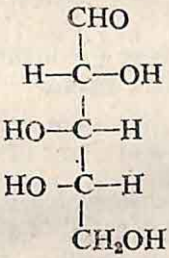
Appendage. Any external outgrowth of a plant which is not having apparent essential function.

Appressorium. Used for describing the swelling at the tip of a germ-tube or hypha of some parasitic fungi. It is in close contact with the host, and puts out a fine tube through the host's cell or stoma.

Aquatic. Used for describing the nature of habitat which becomes dominated by excessive water. A pond is example. Plants occurring naturally in aquatic habitat are called aquatic plants.

Arabans. The polysacharides which are derived from arabinose. Examples are hemicelluloses, mucilages, gums, pectin. See *Pentosans.*

Arabinose. A pentose sugar ; an aldose.



$$\begin{array}{c} \mathrm{CHO} \\ | \\ \mathrm{H{-}C{-}OH} \\ | \\ \mathrm{HO{-}C{-}H} \\ | \\ \mathrm{HO{-}C{-}H} \\ | \\ \mathrm{CH_2OH} \end{array}$$

L-Arabinose

Arboretum. An area which is having cultivation of a wide variety of woody plants only *i.e*, trees, shrubs, vines, lians etc., in a particular climatic area.

Arbuscle. (1) A dwarf tree, or a shrub which is looking like a tree.

(2) A much-branched haustorium, which is formed by some endophytic fungi. It is sometimes later digested by the host.

Arbuscular-Vesicular Mycorrhiza. *See vesicular-arbuscular mycorrhiza.*

Archegoniophore. An erect reproductive structure in certain liverworts which has a stalk and a disc at the tip of stalk. The disc is having sterile, ray-like structures which are radiating from it. Disc bears archegonia on the lower side. *Compare antheridiophore.*

Archegonium. The flask-shaped container of the ovum (egg cell) of liverworts, mosses, ferns, and some gynmnosperms. The swollen base (venter) has the egg-cell, and gets surrounded by the neck, with neck canal-cells.

Areole. Any area which is outlined clearly on a surface. For example, segments of lamina are demarcated by vein. A surface divided into areoles which is splitted by cracks into areas is known as *areolate.*

2. The sunken cushion which is representing a condensed lateral shoot from which spines, branches and flowers are arising.

These may occur singly on tubercles or in rows along raised rows.

Arginine. δ-Guanidine-α--amino-valeric acid ($NH{=}C(NH_2){-}NH.CH_2.(CH_2)_2.CH(NH_2).COOH$). One of the principle amino-acids constituting plant protein.

Aril. A fleshy, coloured covering on the seed which arises as an upgrowth of the funicle or base of the ovule, and may be a tuft of hairs.

Arillode. A structure which looks like an aril, but not formed from the placenta.

Aristate. Describing a structure which bears an awn such as glume or lemma. *Compare bearded*.

Armature. The persistent woody scales which are present at the base of the leaves and stems of Cyatheaceous ferns.

Artefact. A structure which is not usually present in a cell, but produced during investigation, *e.g*. during staining.

Arthrogenous. (1) Of bacteria where the individual is developed into a spore.

(2) Developed from pieces which are separated from the parent plant.

Arthrospore. (1) A spore which is formed by the breaking of the hyphae, especially in the Actinomycetes.

(2) A spore which is formed by the segmentation of, and the separation from the present cell.

Artificial Classification. A classification which is based at least in part on artificial characters.

Artificial Community. A plant community which is maintained by artificial means, *e.g*. a garden.

Ascocarp. The fruiting-body of an ascomycete which is usually developed from one fertilized ascogonium. It is made up from asci, paraphysis (sterile hairs) and a denser surrounding periderm.

Ascogenous Hyphae. The hyphae which are growing from the zygote of the Euascomycetes. There are several ascogenous hyphae which develop from each zygote, and each hypha bears several asci.

Ascogonium. The female sex-organs of the Euscomycetes, which after fertilization, produce the ascogenous hyphae.

Ascogonium. The cell, or group of cells of the Ascomycetes which are fertilized by the antheridum.

Ascorbic Acid (Vitamin C). A lactone of a sugar acid. It occurs in high concentration in certain fruits and green vegetables. It acts as cofactor in hydroxylation of proline to hydroxyproline.

Ascospore. A haploid spore which is formed in ascus of certain fungi. Two nuclei of dikaryotic ascus first fuse and then undergo meiosis to form four haploid nuclei which undergo mitosis forming ascospores in an ascus.

Ascus. A sac-like cell in the perfect stage of an Ascomycete, in which the ascospores are produced.

Asepalous. Having no sepals.

Aseptate. Lacking cross-walls.

Asexual. Without sex-organs or sex-spores.

Asexual Reproduction. Any method of reproduction which does not involve any fusion of any reproductive units. Structure formed asexually may be a spore or a specialised or unspecialised portion of parent tissue which gets separated from the parent. *Compare sexual reqroduction.*

Asparagine. One of the amino-acids occurring in proteins. $COOH.CH_2.CH(NH_2).CONH_2$. The amide of aspartic acid, and occurs widely in plants.

Assimiatory Quotient, Assimilation Quotient. Describing the ratio of carbon-dioxide intake to oxygen output (CO_2/O_2). This ratio is usually near 1, which is in agreement with the equation :

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2.$$

Association. A large climax community which is named after the dominant types of plant species. Examples are deciduous-forest association, heath association, etc.

Assortive Mating. Used for non-random breeding among organisms, if breeding occurs between similar phenotypes, it is *positive assortive mating* leading to inbreeding and if between dissimilar phenotypes, it is *negative assortive mating* leading to outbreeding. Pollination mechanism is having major influence on the breeding patterns.

Aster. A star-like arrangement formed by fibrils which are radiating from a centriole. Asters become conspicous at poles of spindle as cell division starts in some primitive plant cells.

Astrosclereid (Asteroscleried, Star-sclereid. A relatively short sclerenchyma cell (sclereid) having often conspicuously branched shape. They are usually present singly or in small groups and are often found in mesophyll of leaves where they are used for strengthening the structure.

Atactostele. A stele with vascular bundles which are irregularly arranged in the ground tissue, typical in monocotyledonous stems.

Atmometer. An apparatus used for measuring the rate of evaporation from a non-living wet surface like a porous clay pot.

Atropous. *See orthotropus.*

Auricle. Small earlike projection from the base of a leaf or a petal. It is seen at the base of a leaf blade in grasses. *See also ligule.*

Aurones. Used for one of the two groups of anthochlor flower pigments. They are probably formed by oxidation of chalcones. They are found in many members of Compositae especially genus *Coreopsis.*

Autapomorphy. Any derived character state which is possessed only by members of one particular taxon. Autapomorphies are used to distinguish related taxa and their numbers.

Autecology. Used for the study of any one particular population in relation to its particular environmental conditions. It is involving the study of life cycle, effects of all the biotic and abiotic environmental factors at each stage of life cycle with quantitative recording of variations within and between populations. *Compare snyecology.*

Autodiploid. Gamete which has diploid number of chromosomes. Autodiploids may arise either through fault in meiosis or from a tetraploid tissue. These may undergo fusion with another similar gamete to form tetraploid or may develop parthenogenetically. Autodiploid is also used to describe totally homozygous diploid plants which are resulting from doubling of chromosome number of a haploid plant.

Autoecious. Said of the Rusts producing the different spore forms on one host, *i.e.*, completing the life-cycle on one host.

Autogamy. (1) Self-fertilization.

(2) The fusion of sister cells.

(3) The fusion of nuclei in pairs within one cell of a female organ, without cell fusion having taken place.

Autoicous. Having male and female inflorescences on the same plant.

Autolysis. The destruction of cell-contents by enzymes produced in the cell. It is due to the disordered metabolism of the cell, and may be caused by substances not normally present in the cell.

Automixis. The minging of chromatin derived from two sex cells which are produced by one individual plant.

Autonomic Movement. Describing the movement of plant or its part in response to some stimulus produced within the plant *e.g.*, beating of cilia and flagella, cyclosis, circumnutation etc.

Autophagy. Describing a process by which certain cells are able to digest superfluous or worn out cell organelles. An *autophagic vacoule* is formed around the portion of cytoplasm which has one or more such organelles and surrounding cytoplasm secretes hydrolytic enzymes into this, resulting in digestion of organelles and subsequent reabsorption of degradation products. *See also autolysis*.

Autophyte. A plant synthesising complex food substances from simple compounds, *e.g.* green plants.

Autopolyploid. A polyploid having identical sets of chromosomes, *i.e.* derived from the same specics.

Autopotamous. Orginating in fresh water.

Autosome. A chromosome (other than a sex chromosome). It is a normal chromosome, having its normal homologue.

Autospore. An aplanospore of algal cells which is similar in shape and size to the parent cell.

Autosyndesis. Used for the pairing of chromosomes which are coming from the same polyploid parents, or remote polyploid ancestors.

Autotetraploid. A tetraploid having four similar sets of chromosomes.

Autotroph. A plant using carbon dioxide as its sole source of carbon, or more generally a plant manufacturing complex organic compounds from simple inorganic sources. *Autotrophic bacteria* can employ carbon dioxide.

Autotropism. A tendency to grow in a straight line.

Auxanometer. A piece of apparatus which is used to measure the elongation of plant shoots. It involves a lever to exaggerate the actual growth.

Auxiliary Cell. An accessory cell present in the thallus of some Floridae from which the gonimoblast filaments grow, after the zygote nucleus gets migrated into it from the carpogomium.

Auxins (*Plant Growth-Regulators*; *Plant Growth-Substances*; *plant hormones*.) A substance which is produced in one tissue, and migrated to effect the development of another tissue. The tissues producing the auxin are typically meristematic, and the effect of the auxin is specific. They correlate the growth of the plant. There are certain substances, *e.g.* gibberillin, produced by one plant which may effect the growth of another plant when applied artificially.

The best known is $C_{18}H_{32}O_5$ which causes elongation of individual cell in the growing tips of plants.

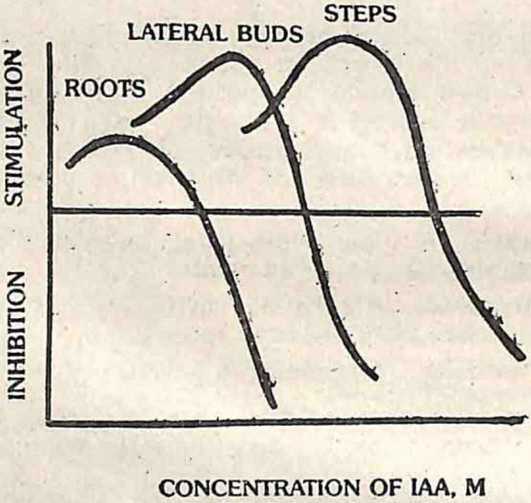


Fig. 2. The effects of auxin concentration on the growth of different organs.

Auxospore. A rejuvenescent spore which is produced under adverse environmental conditions by some diatoms. When it is produced by pennate diatoms, formation is generally associated with sexual reproduction, by the enlargement of a zygote or parthenogenetic gamete.

Auxotroph. A type of biochemical mutant which can grow normally when provided with supplement in the diet for replacing the substance which it can not form itself *e.g.* certain mutant of *Neurospora crassa* require arginine in culture to grow normally.

Available space theory. According to this theory origin of new leaf primordia at a stem apex has been governed physically by the amount of space available between existing primordia. Further, the origin of a primordium requires a certain minimum amount of space and such a space is usually between penultimate primordium and the one formed previous to that. See *also repulsion theory*, *phyllotaxis*.

Awn. (*i*) A bristle present on the flowering glumes of the Graminae.

(*ii*) A long thread-like outgrowth on certain fruits.

Axeny. Used for the resistance of a plant to a pathogen, without the presence of morphological barriers. 'Passive' resistance.

Axenic Culture (*Pure culture*). Used for culture having only one type of organisms or cell. It is derived from pure parent culture and is made to grow under sterile condition.

Axial. Used for describing cell which are derived from fusiform initials and are elongated paralled to the long axis of an organ. All these cells are collectively known as ***axial system.***

Axil. Describing the angle between upper surface of a leaf or other similar structure and the axis on which it gets attached.

Axile. Used for describing position of chloroplast which is situated on the central axis of the cell.

Axile Placentation. A type of placentation occurring in a multicarpellary, syncarpous, multiocular ovary in which placentae are arising from central axis of the ovary; one is present in each locule of the ovary.

Axillary. Used for describing the position of an organ like bud, inflorescence, flower, meristem etc. in the axis of a leaf or other similar organ.

Axis. The main part of the plant body which consists of the stem and root. It possesses a central stele, cortex and epidermis, and bearing leaves, and/or hairs.

Azygote. An individual which is developed without involving fertilization, from haploid individual.

Azygospore. A zygospore which is formed parthenogenetically, and is a resting spore. The term has been sometimes confined to zygospores formed from gametes.

B

B. A class of flowers in which their nectar is fully concealed.

B^1. A class a flowers which are similar to *B* but having the flowers in heads.

Bacca. A berry which is formed from an inferior ovary. It means a berry to general.

Baccate. Used for describing a structure which is shaped like a berry *e.g.* the arils of yew.

Bacillus. Any bacterium which is shaped like a rod. *Compare* coccus, vibrio, spirullum.

Back Cross. The fertilization of gametes from a hybrid by gametes from one of the parents of the hybrid. The term is equivalent to a genetically equivalent cross to this, but does not include a test cross (*q.v.*).

Bacteria. Unicellular plants lacking chlorophyll. They reproduce by binary fission. They are probably related to the Fungi. Most are saprophytic or parasitic, but some are autotrophic, Some are pigmented, and others are important pathogens of plants and animals, including man.

Bacterial transformation. The phenomenon of incorporation of genetic material into a bacterial cell from DNA in the surroundtng medium. The phenomenon was first discovered by F. Griffith in 1928 who transformed rough corted *Diplococcus pneumoniae* into smooth-coated strain by mixing it with extracts from the latter under approptiate conditions. Later, it was shown by Avery, macLeod and McCarty (1944) that DNA is responsible for this bacterial transformation.

Bacteriochlorophyll. Any of the forms of chlorophylls found in photo synthetic bacteria. Bacteriochlorophyll occurs in all bacteria, and is a tetrahydrporphyrin. Its absorption spectrum exhibits 3 peaks at 365, 605 and 770 nm. Some bacteria have additional forms of bacteriochlorophyll designated Bchl b Bchl c and Bchl d.

Bacteriods. Irregular, enlarged forms of rod-shaped bacteria especially of the root-nodule forming species. These are ultimately absorbed by the cells of the root-nodule.

Bacteriods. A *Rhizobium* bacterium present in a root nodule after it gets increased in size (about 40 times its original size) and changed in shape to a characteristic X-or Y-shaped cell. They lose the capacity of autonomous growth and become totally dependent on the host. In this metamorphosed state, bacteria bring about nitrogen fixation.

Bacteriorhiza. A symbiosis taking place between a root and bacteria.

Bacteriostatic. Using for a substance which inhibits the growth and/or multiplication of bacteria, but does not kill them.

Bacterium. A rod- shaped member of the Bacteria.

Balance. The adjustment of the genetic material of an individual to permit for the healthy growth and development of the individual.

Balbiani Ring (*chromosome puff*). A swollen region of polytene chromosome which corresponds to a site where mRNA synthesis is taking place actively. Although polytene chromosomes are occurring in dipterous insects, formation of such ring (puffing phenommenon) is assumed to have wider genetic significance.

Ballistospore. A spore violently thrown out from place of formation to bring about wide dispersal.

Calsam. A semisolid mixture of resins and essential oils. Examples are Canada balsam from *Abies balsamea* and frankinacense from species of *Boswellia.*

Bark. Used for protective suberised (corky) tissue which is cut off by a secondary meristem (phellogen). The phellogen cuts off cells which get suberised (phelloderm), so that all the cells out side the phellogen ultimately die, so as to form the bark. If the phellogen is deep, cells of the cortex, and phloem may be involved. In a non-technical sense, the bark means all the tissues which are outside the cambium.

Basal Body. (*i*) Used for the part of the thallus of the Blastocladiaceae which is fixed to the substrate by rhizoids the lower end.

(*ii*) Used for a deeply staining granule which is present at the base of a flagellum. It may be the centrosome. See *Blepharoplast.*

Basal Cell. (*i*) Used for the lowest cell which is cut off from the antheridial initial of the Filicales and Hepaticae.

(*ii*) Used for the lower cell which is cut off from the antheridial initial of the Heparicae. It remains sterile.

(*iii*) Used for one of the pair of cells formed by the initial division of a germinating spore of the Lycopodinae, in the early stages of the development of the gametophyte. It gives rise to a rudimentary rhizoidal cell.

(*iv*) A uninucleate cell which may be the oogonium in the Uredinales.

Basal Granule. See *kinetosome.*

Basal Placentation. Type of placentation occurring in unilocular ovary having only one ovule in which placenta develop at the base of ovary *e.g.* in *Polygonum* sp.

Base Analogue. A chemical resembling a natural purine or pyrimidine molecule to the extent that it may be incorported into DNA during replication or RNA synthesis.

Base Number (*Basic number*). The number of chromosomes present in the characteristic genome of an organism, generally between 6 and 13 and represented by symbol X.

Base Pair. One of the pairs of bases forming the cross-links in the DNA molecule. They are always paired in the following manner : Adenine and Thymine, Guanine and Cytosine or 5-methyl cytosine.

Base Ratio. A ratio between quantities of one base to another base or one base pair to another base pair in DNA. Ratio of A : T and G : C is always one. Comparison of base pair ratios, A + T : G + C or percentage G + C of total remains constant in a species but different in different species.

Base Triplet Hypothesis. According to this hypothesis, the shortest sequence of any four bases that could specify all the types of amino acids found in proteins is three.

Basidiocarp. The reproductive organ of all basidiomycete fungi (except Ustilaginales and Uredinales) which are bearing basidia. It may be shaped like a mushroom, bracket, hollow sphere or cylinder. Much of it is composed of sterile pseudoparenchymatous tissue. The basidia are borne in a fertile layer termed hymenium.

Basidiospore. A haploid spore, 4 in number and borne on outer surface of basidium in basidiomycete fungi.

Basidium. Used for the structure in basidiomycete fungi which bears basidiospores, usually on projections called sterigmata. Each basidium is usually one-celled but segmented in some *e.g.*, in Ustilaginales and Uredinales.

Basifixed. Used for describing an anther which gets joined to filament at it is base. *Compare dorsifixed versatile.*

Basipetal. Developing so that the oldest structures are at the apex, and the youngest at the base.

Bast. Sometimes used to mean 'phloem' and sometimes to mean 'bast-fibre'. A very vague term which, should not be used.

B-Chromosome (*Accessory Chromosome*, *Supernumerary Chromosome*). Used for any of a number of small chromosomes found in some organisms in addition to the fixed number of stable chromosomes characteristic of the species (A-chromosomes). They are widely distribited, and found to be in 80 genera of 20 families of plant. Their number may be different in the members of a species and even in an organism with greater number found in gametic nucleus. They are composed of heterochromatin largely and appear to have no effect in many cases but in large number of cases, may be deleterious.

Beaded. Used of the gill of an agaric which is having a row of small droplets of liquid along its edge.

Beaked. Having a long, pointed prolongation.

Bearded. (*i*) Possessing many awns as the ears of *Festuca ambigua*.

(*ii*) Possessing any type of stiff hairs *e.g.*, hairy lower surface of petals of *Iris pseudacorus*.

Beaumont period. Used for 48 hour period during which minimum temperature is 10°C and relative humidity 75 per cent or more. This period found out by meterological data predicted that an outbreak of patato late blight may take place after this period.

Belt Transect. A narrow strip of land which is a taken as a sample of an area in studying the vegetation.

Bennettitales. An order of Gymnosperms of the Mesozoic, bearing bisporangiate strobili, having the megasporophylls and microsporophylls in a spiral inside a cluster of sterile leaves, *i.e.* rather like an angiosperm flower.

Benthos. Organisms which are living or near the bottom of a large mass of water.

Berry (*Bacca*). A fleshy indehiscent fruit which has many seeds. It is developed from mono or polycarpellary, superior or inferior ovary with axile or parietal placentation. Epicarp is forming outer dry cover, mesocarp fleshy and endocarp membranous *e.g.*, fruit of tomato, brinjal, banana, grape.

Betacyanin. Any of nitrogen-having red pigments *e.g.*, betanidin, which replace and perform the function of floral pigment anthocyanin in certain plants.

Betalain. A class of nitrogen-having pigment which include betacyanins and betaxanthins, and occur in plants of certain families which have been traditionally placed in Centrospermae (except family Cactaceae though some have placed this family in this group on the basis of presence of betalain). These pigments have been found to replace and function as anthocyanins.

Betaxanthin. Any of nitrogen-containing yellow pigments which belong to group of pigments betalain and replace and function such as anthocyanin floral pigment in certain families.

Between race. A race of plants intermediate in character between the typical species and one of its well-marked sub-species or varieties.

Bicapsular. A capsule which consists of two chambers.

Bicarpellary, Bicarpelate. A gynoecium having 2 carpels.

Bicollateral Bundle. A vascular bundle having phloem inside and outside the xylem.

Biconic. Looking like two cones which are placed base to base.

Biconjugate. A compound leaf having two main ribs, each bearing a pair of leaflets.

Biennial. A plant developing vegetatively, and producing a food-storage organ in the first year. It flowers in the second year only, and it then dies.

Biflagellatae. A group of the Phycomycetes with spores possessing two flagella.

Biflagellate. Possessing two flagella.

Bifoliate, Bifolioate. Used for a compound leaf with two leaflets.

Bifurcate. Forked, or twice forked.

Biflavonyls. The dimers of flavone apigenin. Belonging to flavonoids, widely found in gymnosperms, scarse or absent in other plant groups.

Bigeneric. A hybrid which is derived from an intergenric cross. An example is ***Triticale*** which is derived from a cross between *Triticum* and *Secale*.

Bilateral Symmetry. Used for describing arrangement of parts in an organ or organism in a way so that it becomes possible to divide in to two exactly identical halves along one given plane only *e.g.* it is possible that most leaves can be divided into two similar halves by cutting them along midrib only.

Biloprotein. Any of blue or red pigments occurring in blue-blue-green and red algae. They are accessory photosynthetic pigments but unlike cholrophylls and carotenoids are water soluble. Structully they are similar to porphyrin part of chlorophyll molecule but without magnesium. They incorporate 3 classes of pigments, phycocyanins, phycoerythrins and allophycocyanins. See *also phycobilisome*.

Binary Fission. A method of asexual reproduction taking place in unicellular organisms in which nucleus and then cytoplasm under go division mitotically to form two morphologically and genetically identical but smaller individuals.

Binomial Nomenclature. A system of naming by two Latin, or Latinized names, the first being the generic name, while the second the specific. ***E.g. Ranunculus repens*** and ***Ranunculus bulbosla*** belong to the same genus, but different species. The name is generally followed by an abbreviation of the name of the person first naming the species, *e.g*, L. denotes the abbreviation for Linnaeus.

Bioassay (*Biological assay*). A quantitation assessment of the effect of a substance on a living organism by comparison with effects of a similar substance of known concentration. Bioassays find extensive use in measuring effects of different auxins and gibberellins or pollutants on plant growth.

Biochemical Genetics. Branch of genetics which deals with inheritance at molecular level. It includes study of structure of DNA, its replication, genetic code, transcription and translation in protein synthesis and regulation of gene expression.

Biochemical Mutant. An organism having a mutation which results in inhibition or defect in synthesis of some particular enzyme in the organism. Such mutants are more common in lower plants and may be induced by irradiation with X-rays. These have been proved extremely useful to elucidate the stages in a number of metabolic pathways.

Biochemical Taxonomy. See *chemotaxonomy*.

Bioenergetics. The study of energy transfer in living organisms within the framework of the principles and laws of thermodynamics. It incorporates transfer of energy in the body, its conversion to work, degradation to heat etc.

Biogenesis. A theory, according to which life can originate only from preexisting life and never from non-living matter. *Compare* abiogenesis, origin of life, spontaneous generation.

Biogenetic Law. An hypothesis which states that during its development, an individual repeats the evolution of its race in a shortened form.

Biological Control. Implies the introduction, or preservation and encouragement of a natural enemy of a pest, disease, or disease-carrying organism, which may help in its control.

Biological Clock. Used for mechanism of keeping track of time internally in organisms. It is responsible for periodic or cyclic triggering of certain physioloical or behavioural responses in the organism. Biological clocks are often controlled by growth substances.

Biological Spectrum. A table which shows the percentage frequency of occurrence of the various plants and animals in a defined area.

Bioluminescence. The enzymatic emission of light by living organisms, without their being previously illuminated. It is exhibited by some bacteria and fungi. It is wrongly called phosphorescence. The light is produced by the action of the enzyme luctiferase in oxidizing the ligh-producing molecule lutiferin.

Biomass. A mass of living material at a place at a time within the frame of reference of study. For example, in the study of plant as an individual, biomass implies total mass of living material in that plant while in the study of as community, it implies total mass of all the living organisms included in that community.

Biome. A large community of plants and animals which has been characterized by its particular type of dominant vegetation and its associaetd animals, *e.g.* tundra.

Biometer. A method used for assessing the amount of life by measuring the respiration, *e.g.* in a soil sample.

Biometry. The use of mathematics, especially statistics in the study of living organisms.

Bios Factor. A substance which is essential for the growth of a plant, especially yeasts, obtained from the environment. It is a mixture of aneurin, biotin, and, other substances. Biotin means Vitamin H, and is probably identical to the co-enzyme R.

Bioseries. In evolution, a historical sequence which is formed by the changes in any one inheritable character.

Biosphere. Used for a zone which includes earth's surface (and surface water) its atmosphere, underlying crust where life can exist and the biome of this zone. Biosphere can be considered to be a single ecosystem and is often termed as *ecosphere*.

Biosynthesis. Synthesis of a substance which is taking place by some biochchemiaal reaction or a series of biochemical reactions (*biosynthetic pathway.*)

Biosystematics. Involves the study of variations and relationships in populations rather than individuals. It is possible to assess genetic and evolutionary nature of groups by examining cytology, comparative morphology and ecology. It is often considered as the taxonomic application of genecology or occasionally as experimental taxonomy.

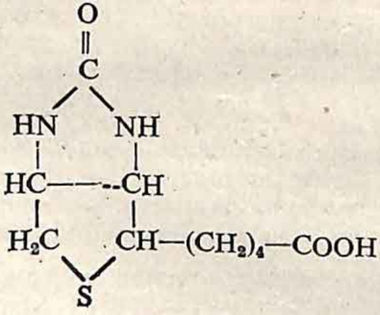
Biota. Used for flora and fauna either of a particular region or of a given geological period.

Biotic Adaptation. Changes in form or physiology, which are believed to have arisen as a result of competition with other plants.

Biotic Climax. A climax community which is being maintained by living organisms, *e.g.* grassland prevented from becoming forest by the grazing of animals.

Biotic Factor. The influence of one living organism on another.

Biotin. Vitamin H. It is essential growth substance for yeasts.



Bipinnate. Used for a pinnate leaf in which leaflets themselves have been further subdivided pinnately *e.g.* in *Mimosa pudica*.

Bird's-Nest Fungi. An order of Nidulariales of Gasteromycetes having some 9 genera and 60 species. They have nest-like wall of basidiocarp having a number of separate spore masses (eggs) which get exposed after drying back of covering membrane.

Bisexual. Used for a having both male and female sex organs, *e.g.*, a flower having anthers and ovaries.

Bisporagiate. Used for strobilus having megasporophylls, and microsporophylls, with microsporangia, megasporangia.

Biuret Test. A test for protein which in the presence of strong alkaline solution, and copper ions (as copper sulphate) yields a pinkish-mauve colour.

Blackman Reaction. A term including all the reactions in the photosynthetic process which do not require light (dark reactions). Named after the discoverer.

Bladder. A modified leaf present on the bladderwort. It is used for catching small aquatic animals.

Blanket Bog. It consists of acid peat which is formed from remains of bog plants. It varies in thickness and its high acidity (pH 3.0-4.5) is caused by continuous flow of water through peat which washes away bases and prevents minerals from underlying rocks reaching plant roots. Such bog can be formed over limestone.

Blastospore. The spores which are produced by budding as in Taphrinales where these have been formed by budding of ascospores.

Bleeding. The exuding of sap from a wound. BLEEDING PRESSURE=ROOT PRESSURE.

Blemmatogen. A layer of hyphae having thickened walls, which covers the button of an agaric, and sometimes forms the veil.

Blending Inheritance. The inheritance of characters so that the off-spring, and successive generations are intermediate in form between the original parents. This is because the character has been controlled by several genes.

Blepharoplast. A granule present at the base of a flagellum. It is probably a centrosome.

Blight. The plant diseases in which leaves are suddenly and seriously damaged. Diseases are caused by many types of pathogens. Examples of diseases are late and early blight of potato and fire blight of pears caused by fungi ***Phytophthora infestans*, *Alternaria solani*** and bacterium ***Erwinia amylovora*** respectively.

Bloom. Grains, short rods, or crusts of wax deposited on the surface of some leaves and fruits.

Blue-Green Algae. The members of Cyanophyta. Plants have body which is surrounded by mucilage sheath. Their cell structure is always prokaryotic and sexual reproduction is not known. No flagellate structures are formed at any stage in life.

Body Cell. A fertile cell which is formed along with infertile stalk cell after mitotic division of generative cell in the pollen tube of gymnosperms. It gets divided at a later stage to form 2 antherozoids (sperm cells).

Bog. A region of permanently wet land which is subjected to high rainfall and poor drainage resulting in persistent moist atmosphere in the area. These conditions result in a climax community without trees. The most common plants in this region are bog mosses, ling, crossed leaved heath, bog myrtle. rushes and sedges as common plants. Bog is commonly found in upland and western areas of temperate regions. There are three main types of bog; *blanket bog*, *raised bog* and *valley bog*.

Bolting. Used for the permature production of flowers and seeds in plants. It is common in biennial crops *e.g.*, sugar beet. If they run to seed in the first growing season then their yield is generally considerably reduced.

Bordeaux Mixture. A fungicide made of copper sulphate and quick lime. A common formula is 4 lb. copper sulphate and quick lime, dissolved in 50 gal. water.

Border Parenchyma. A sheath of one or more layers of parenchyma which are surrounding a vascular bundle.

Bordered Pit. A thin area in the wall between two vessels surrounded by overchanging rims of thickened wall.

Boreal Forest. (taiga northern coniferous forest). Used for a cold forest having relatively few types of trees, mainly fir, pine and spruce with some deciduous birches and larches. Such forests are found in North America and northern Eurasia.

Bostryx. Used for a coiled helicoid cyme (*See* monochasium) in which overall structure is resembling a spring *e.g.* inflorescence *Hypericum* species.

Bottom Yeast. A yeast collecting at the bottom of the vessel during alcoholic fermentation.

Boundary Layer. A layer of liquid or gas next to a solid surface. It flows more slowly than that away from the surface. In plants there exists a boundary layer of air at a leaf surface, whose width is inversely proportional to wind speed. This layer also offers resistance to transpiration.

Brachysclereid (stone cell). A relatively short, more or less isodiametric schlerenchyma cell, present singly or in small groups although they are found in large numbers in some tissues *e.g.* fleshy part of pear fruit.

Bracket Fungi. The members of order Sphyllophorales (Polyporales) of Hymenomycetes that are producing large basidiocarps which rarely have gills. These include polypores which grow out in a bracket-like manner from both living and dead wood *e.g.*, *Polyporus squamosus*.

Bract. A leaf-like organ which is extending an inflorescence. It is sometimes brightly coloured and petal-like *e.g.* in *Euphorbia pulcherrima*.

Bracteole. A leaf, generally small, present on a flower stalk.

Bracteomania. Used for the abnormal production of large numbers of bracts, generally at the expense of normal flowers.

Bradytelic. Used in chronistics, to describe a species that has remained more or less unchanged for millions of years. Examples of bradytelic are certain gymnosperms like *Podocarpous Ginkgo* and *Welwitschia*. Evidence of such nature of these plants comes from studies of fossils and karyotypes of these plants.

Brand Spore. A thick-walled resting spore which is formed by the Ustilaginales. They are dark coloured and found in sooty masses.

Braun-Blanquet Scheme. A method of describing an area of vegetation devised by J. Braun-Blanquet in 1927. It is used to survey large areas rapidly. Two scales are used, one employs+sign and numbers from 1 to 5 denoting both the number of species and the proportion of area covered by the species ranging from+(sparse and covering a small area) to 5 (covering more than 75 per cent of the area). Other scale employs how the species are around and ranges from class Soc. I (growing singly) to Soc. 5 (growing in pure populations.) It is possible to obtain information by laying down adjacent quadrats of increasing size. A scale for expressing *degrees of presence of population* is also included in which 5=constantly present in 80-100 percent of the areass and 1=rare *i.e.* in 1-20 percent areas only.

Breaking of Meres. The sudden development of large masses of blue-green algae in small masses of fresh water.

Breathing Root. A root which is produced by large plants growing in mud ; it projects above the mud and water allowing the air to reach the root below.

Brochidodromous. (*See camptodromous*). Used for describing the venation in which there is a single primary vein and the secondary veins are rising from it curve upwards towards leaf margin and join together in a series of conspicuous loops at the margin *e.g.*, in *Prunus avium.*

Brown Algae. Members of Phaephayta. These are predonantly marine vegetative organisation is more advanced relatively, cell wall has alginic and fucinic acids characteristically, cytoplasm has fucosan vesicles. The sexual reproduction is usually oogamus.

Brown Earth. A soil formed on loams and clays, having a fairly low air-content. Though it is typically acid, the amount of exchange calcium has been fairly high.

Brownian Movement. The continuous movements of the particles in a colloidal solution. It is caused by the unbalanced bombardment with the molecules of the liquid.

Bryokinin. A growth substance which is found in certain mosses *e.g., Funaria*, which stimulates formation of buds and subsequently leafy plants from filamentous protonema.

Bud. A compacted stem having leaves and sometimes flowers. This gets elongated to produce the mature shoot and its attached organs.

Budding. (*i*) The production of buds in organs.

(*ii*) Grafting a bud from a stock to a scion.

(*iii*) The asexual reproduction of unicellular fungi, *e.g.* yeasts. or spores, by the development of a new cell from the outgrowth of the parent.

Bulb. An organ of storage and vegetative reproduction. It consists of a flattened stem which is bearing fleshy leaves, or leaf-bases with buds in their axils, and scale-leaves.

Bulbil. (*i*) A small bulb.

(*ii*) Out growths on the stem of some species of *Lycopodium* which arefunctioning for vegetative reproduction. They are probably modified leaves.

(*iii*) An organ of asexual reproduction which is produced on the rhizoids of the Charales.

(*iv*) A small sclerotium-like body, of a few cells produced by some fungi.

Bulliform Cells (*motor cells*). Any of the large cells occurring at places in longitudinal rows in leaf epidermis of rolling xerophytes (that show rolling of lamina in dryness) which are mostly grasses. These cells are involved in rolling and unrolling of lamina due to rapid loss and reabsorption of water during dry and wet conditions respectively.

Bundle Cap. One or more layers of sclerenchyma on thickened parenchyma cells over the xylem or phloem or both poles of a vascular bundle. It occurs in certain plants only.

Bundle Sheath. The sheath of parenchyma surrounding the vascular bundle of a leaf. The elongated cells conduct materials between the bundle and the leaf parenchyma.

Bunt. A covered smut disease of wheat. It is sometimes celled *stinking smut* due to smell of rotten fish given off by the spore mass of infecting fungus *Telletia caries*. Dwarf bunt of wheat has been caused by *T. contraversa*. Infected grains are transformed into balls of bunt spores. At the time of threshing these spores are spread to healthy seeds.

Bur (*burr*). A type of pseudocarp in which fruit has been covered by a persistant barbed involucre as in *Arctium* and *Xanthium*.

Burdo. A graft-hybrid formed by the fusion of vegetative nuclei from the stock and scion.

Burgundy Mixture. A fungicide which is similar to Bordeaux mixture, but sodium carbonate has replaced the lime.

Butterfly Flower. A flower pollinated by butterfflies.

Button. The young fructification of an agaric, before the cap gets broken away from the stipe, and the pileus gets exposed.

Buttress Root. A root, generally adventitious and above ground, imparting additional support to the stem or trunk.

C

C_3 plant. A plant which is forming a 3-carbon compound (phosphoglyceric acid) as the first stable product of dark-fixation of CO_2 in photosynthesis. Most of the plants of temperate region exhibit C_3 photosynthetic pathway.

C_4 plant. A plant having first stable product of dark-fixation of CO_2 as a 4-carbon compound (oxalocetic acid). Many tropical plants exhibit C_4 pathway of photosynthesis.

Caducous. Used for describing parts of a plant which fall off easily or at an early stage in the life of the plant.

Caecum. Describing an extension of the embryo-sac into the endosperm.

Caeoma. An aecium having no peridium, with or without paraphyses, or it is represented by a sterile ring of hyphae.

Caespitous. A plant which has a tufted form of growth as in many grasses like *Deschampsia caespitosa*.

Caffeine. A purine occurring in coffee beans, tea leaves, and cacao beans. An oxidation product of the methyl derivative of purine.

Calcicole. A plant living and growing successfully in lime-rich soil. Example of such a plant is *Dactylorhiza fuchsii*. *Compare* calcifuge.

Calcification. The accumulation of calcium carbonate, on or in the cell-walls.

Calciferae. Monocotyledons having a distinct calyx and corolla.

Calcifuge, Calciphobe, Calcifobous. A plant species not thriving on a lime soil. It prefers an acid soil.

Callose. (i) A carbohydrate, insoluble in cupraammonia, but soluble in 1% solutions of caustic alkalies. It gets deposited seasonally or permanently on sieve plates, thereby making them to stop functioning.

Callosity. See *Callus* (3).

Callus. (1) A more or less corky secondary tissue which is developed by woody plants over a wound. It is generally derived from a cambium.

(2) The swollen base of the inferior palea of grasses which is next to the axis.

A mass of material which is formed on a cell-wall around the germ-tube of a parasitic fungus.

Calvin Cycle (Benson-Calvin-Bassham cycle). Representing the sequence of reactions in photosynthetic pathway which are taking place without the use of light and fix CO_2 (*dark reactions*) by involving ATP and $NADH_2$. Cycle occurs in stroma of chloroplast, starting with carboxylation and cleavage of ribulose biphosphate (RuBp) to form 2 molecules of phosphglyceric acid which get reduced to phosphoglyceraldehyde by involving $NADH_2$ and later RuBp gets regenerated by a complex series of reactions involving carboxylation of 6 RuBp molecules and regeneration of 6 RuBp molecules alongwith formation of one molecule of glucose. Overall series of reactions may be put as follows :

$$6\ RuBP + 6\ CO_2 + 18\ ATP + 12\ NADPH + 12\ H^+ + 12H_2O \rightarrow 6RuBP + glucose + 18\ Pi + 18\ ADP + 12\ NADP^+$$

See also Hatch-Slack pathway.

Calyptra. A layer of cells which is protecting the developing sporophyte in the mosses and liverworts. It forms a hood over capsule and gets derived from venter wall of archegonium which ruptures by elongation of seta. 2. (root cap) Hood-shaped cap of parenchymatous cells at the root tip which is protecting the growing root apex from abrasion when meristem grows into the hard soil. It gets derived from separate meristem *calyptrogen*.

Calyptrogen. A meristematic tissue from which the root-cap in many plants is formed.

Calyx. The outer whorl of a flower made up of sepals which are generally green and protect the flower in the bud.

Calyx Tube. (1) A tube which is formed by the fusion of at least the lower part of the calyx. (2) The hollowed receptacle of a perigynous flower, on which the petals and stames grow.

Cambiform Cell. An elongated, pointed parenchymatous cell which occurs in the phloem.

Cambium. Representing a lateral meristem which is found in vascular plants. It is exhibiting secondary growth by periclinic divisions of initials. It is present in stems mostly between xylem and pholem tissues and formed at other positions also (in secondary growth). There are two cambia, the vascular cambium and the phellogen.

Cambrian. Describing the earliest period of geological time scale in the Palaeozoic era, from about 570 to 500 million years ago. Rocks of this period have abundant fossils of marine organisms i.e., algae and such invertebrates as trilobitas and brachiopods. No land organisms are found.

Cam Plant. Used for any plant which shows crassulacean acid metabolism for fixing atmospheric CO_2.

Camptodromous. Used for describing a form of leaf venation in which there is simple primary vein and secondary veins arising from it curve upwards towards the leaf margin.

Campylotropus. Said of a form of ovule orientation in which ovule develops horizontally and funiculus is seen to be attached halfway between the chalaza and the micropyle. It is not very common but may be seen in Malvaceae and Caryophyllaceae.

Canal. An elongated intercellular space which is usually having secretions of various kinds, e.g., oils, resins.

Canal Cell. The initial cell which later undergoes division to fill the central canal of the neck of the archegonia of Bryophyta and Pteridophyta. These cells get disintegrated when the archegonium gets ripened.

Canker. A plant disease which is caused by bacteria or fungi. It gives a limited necrosis of the cortical tissue.

Cap Cell. The cell present at the apex of the fern antheridium. It is shed when the antherozoids get liberated.

Capillarity. (capillary action). Used for the movementofiquids in the lumen of narrow tubes (capillaries) which occurs due to surface tension of liquid.

Capitulum. (1) A head of flowers.

(2) A racemose inflorescence in which the axis is flattened to form a disk. The flowers are sessile having the oldest outside, and enclosed in an involucre of bracts.

Caprification. Used for describing the formation of an inflorescence of a number of flowers on a common receptacle which grows upwards for enclosing the flowers except for a small pore at the apex.

Capri Fig. A race of fig not producing edible fruit, but providing food for the wasps which pollinate the figs.

Capsid. Describing the protein coat of a virus which is surrounding and protecting the nucleic acid within. Its nature determines the host range of virus and infective efficiency. Serological reactions of capsid proteins can be used for identifying viruses.

Capsomere. Describing any of identical polypeptide subunits which make up the capsid protein of a virus.

Capsule. (1) Describihg any dry dehiscent fruit which is derived from two or more many-seeded fused curpels. (2) Describing a transparent layer of gelatinons material which is enveloping some bacterial cells.

Carbohydrate (saccharide). Means a polyhydroxyaldehyde or ketone or their derivatives. Many have structural formula $(CH_2O)n$ thereby suggesting that they—originally were hydrates of carbon. They function as energy-storage molecules or structural elements in plants.

Carbon cycle. Describing the pathway of movement of carbon ecosystem i.e., from one component to other component of ecosystem which is including both living organisms and abiotic environment.

Carbonic Anhydrase. The enzyme catalysing the formation of bicarbonate ions from carbon dioxide and water.—

$$CO_2+H_2O \rightarrow H^+ + HCO_3^-$$

Carboniferous. A geological period which is extending from about 270 to 220 million years ago.

Carboxydismutase. An enzyme catalysing the combination of ribulose-biphosphate and carbon dioxide to form two molecules of phosphoglyceric acid.

Carboxylase. An enzyme which is capable of splitting carbon dioxide from a substrate. e.g. $CH_3.CO.COOH \rightarrow CH_3CHO + CO_2$.

Carcerulus. A fruit which splits at maturity into several one-seeded portions.

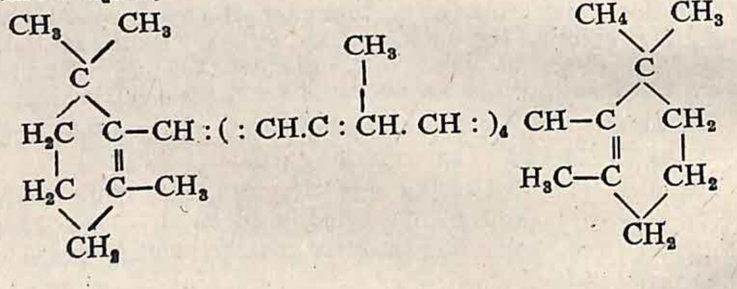
Cardinal Points of Temperature. The minimum point is when growth starts the optimum when growth is best, and the maximum when growth stops.

Carina. A keel, as in the flowers of legumes, has 2 fused lower petals which enclose the stamens and stigma. It may play a part in pollination.

Carinal Canal. A vertical canal which is formed on the inner side of the metaxylem of the Equisetales, formed by the disintegration of the protoxylem.

Carnivorous Plants. Describing plants capable of catching and digesting insects or other small animals.

Carotene (carotin). An orange-coloured hydrocarbon occurring in chloroplasts and other plastids. They are the precursors of vitamin A. $C_{40}H_{56}$



Carotenoids. Used for yellow, orange or red, fat-soluble pigments occurring in all photosynthetic cells. They are accessory pigments, having absorption spectra suggesting their involvement in phototropic responses. Subdivided into *carotenes* and *xanthophylls*. Carotenes are hydrocarbons and xanthophylls their oxygenated derivatives.

Carotenol. *See xanthophylls.*

Carpel. The megasporophyll of an angiosperm which bears the stigma, and frequently an elongated style, and encloses the ovules. The carpels may be separate or united.

Carpogonium. (1) The female sex-organ of the Floridae.

(2) The female sex-organ of some fungi, e.g., in the Erisiphaceae.

Carpomyceteae, Carpomycetes. The fungi having fruit bodies; the higher fungi, i.e., the Ascomycetes and Basidiomycetes.

Carpophore. A raised part of the receptacle which is bearing the carpels and stamens.

Carposporangium. A sporangium in which the carpospores are formed. It is characteristic of the Rhodophycease.

Carpospore. A rounded, uninucleate non-motile spore which is formed from the direct or indirect division of the zygote of the Rhodophyceae.

Carpotrophic. The movement of the flower-stalk after fertilization to bring fruit into a favourable position for the ripening and/or dispersal of the seed.

Carr. Used for describing fern woodland with built-up of peat so that peat level gets raised sufficiently to allow establishment of certain woody plants which can tolerate wet conditions (e.g. Almus, Salix, Viburnum opulus etc.)

Carrier. A plant infected with a virus, which does not show symptoms, but capable of infecting another plant, especially through an insect vector.

Caruncle. Describing a horn-like outgrowth near the hilum of a seed which is formed from integuments e.g., the warty outgrowth of castor seed, also occurs in genera like Euphorbia and Jatrophu.

Caryopsis (grain). An achene in which the pericarp layers get fused; typical of the grasses.

Casparian Strip, Casparian band, caspary's band. A band of suberised material which is present around the radial walls of the individual cells of the endodermis in their primary condition. The material is impervious to water.

Catabolism, Katalolism. Used for describing the break-down of complex molecules to simpler ones releasing energy.

Catacorolla. A second corolla which is formed externally to the true one.

Catalase. An enzyme breaking down hydrogen peroxide (which is toxic) to water and oxygen.

Cataphyll, Cataphyllary Leaves. A simplified form of a leaf, e.g., a scale leaf, bud scale, or cotyledon.

Catapult Mechanism. A method of seed dispersal which depends on the jerking of a long stalk swaying in the wind.

Catkin. A pendulous spike, having many simple, usually unisexual flowers. It is usually bracteate, and falls as a unit when the pollens or seeds are shed.

Catothecium, Catathecium. An inverted perithecium having the asc hanging from its base.

Caudex. (1) Describing the persistent swollen stem base of certain herbaceous perennials. (2) Used for the trunk of a palm or tree fern.

Caulid. The structure forming the 'stem' of a moss or leafy liverwort.

Cauliflory. Used for the phenomenon of production of flowers on tissue which is secondarily thickened such as branches or trunks, rather than at apical meristems. Flowers in this case normally are developed from suppressed side-shoots, infrequently they may arise from phellum.

Cauline. (1) Growing from the stem, in contrast to growing from the base of the plant. (2) Appertaining to the stem.

Cauline Bundle, Cauline Vascular Bundle. A vascular bundle which is formed entirely from the tissue of the stem.

Cavitation. Used for the formation of vapour filled cavities in a flowing liquid due to decrease in pressure, the main cause of disruption of water columns in xylem during water stress in a plant.

Caytoniales. An order of the Gymnospermae, which lived from the Permian to the Jurassic eras. There were no stobili, and the seeds got enclosed in rolled sporophylls.

Cell. (1) A nucleus, with the cytoplasm with which it is in intimate contact; in plants it is generally surrounded by a definite cell-wall. (2) The cavity having pollen in an anther.

Cell Cycle. Used for describing the sequence of events which results into formation of two complete daughter cells from the parent cell. In addition to observable changes of motosis, it includes all biochemical processes occurring during it in the nucleus and cytoplasm.

Cell Division. Used for describing the division of nucleus (karyokinesis) which is followed by division of cytoplasm (cytoplasmic division or cytokinesis) in a cell. It yields the formation of two daughter cells with chromosome number in nucleus of each daughter cell equal to that of the nucleus of parent cell (mitosis).

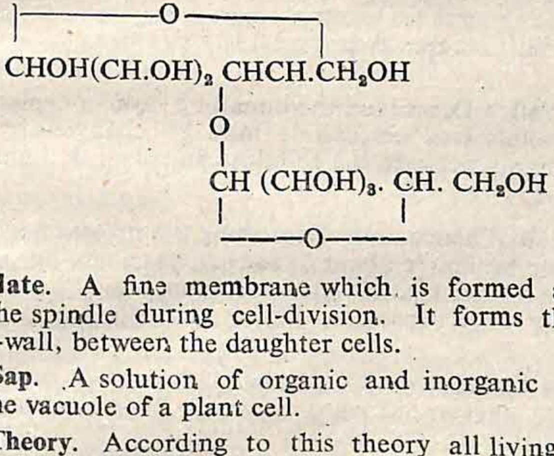
Cell Extension. Increase in length along with volume which is occurring in cells of the region a certain distance behind the apex following cell division. In this process there occurs both vacuolation i.e., uptake of large quantities of water into the cell vacuole by osmosis and the synthesis of new cytoplasm and cell wall material.

Cell Fractionation. Describing the separation of the components of a cell by differential centrifugation.

Cell Lineage. Describing the sequence of cells formed by cell division and cytological changes which yield the formation of differentiated cells having a specific function.

Cell Membrane (Membrane). Used for any membrane which is surrounding either protoplast or any of the cell organelles within it. All membranes have almost same structure as that of plasma membrane and are selectively permeable.

Cellobiose. A reducing disaccharide which is composed of 2 glucose sub-units linked by β (1-4) glycosidic bond. It is formed by incomplete hydrolysis of cellulose by enzyme cellulase. Complete hydrolysis to glucose units is possible by enzyme cellobiase (β-glycosidase).



$$\begin{array}{l} \overline{\qquad\qquad O \qquad\qquad} \\ \mathrm{CHOH(CH.OH)_2\ CHCH.CH_2OH} \\ \qquad\qquad\qquad | \\ \qquad\qquad\qquad \mathrm{O} \\ \qquad\qquad\qquad | \\ \qquad\qquad\qquad \mathrm{CH\ (CHOH)_3.\ CH.\ CH_2OH} \\ \qquad\qquad\qquad \underline{\qquad\quad O \qquad\quad} \end{array}$$

Ceel Plate. A fine membrane which is formed across the equator of the spindle during cell-division. It forms the basis of the new cell-wall, between the daughter cells.

Cell Sap. A solution of organic and inorganic substances present in the vacuole of a plant cell.

Cell Theory. According to this theory all living things are made up of cells that divide during growth and reproduction. (Schleiden and Schwann 1838-9).

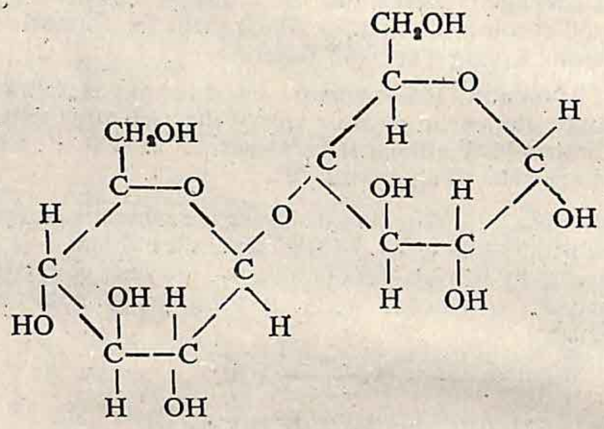
Cell Tissue. A group of cells formed from the division of one or a few cells, and functioning as a whole.

Cellular Slime Moulds. Used for the members of class Acrasiomycetes of Myxomycota that feed on soil bacteria. Organisms are made up of an aggregation of myxamoebae forming pseudoplasmodium. These yield naked masses of walled spores (pseudospores) by a process different from that of other fungi.

Cellulase. An enzyme which is capable of digesting celluose into simpler units.

Cellulosans. A group of carbohydrates similar to cllulose, but with shorter chains, mainly of xylose residues may have uronic acid and mannose units.

Cellulose. Represents a condensation product of various numbers of glucose units, giving a fibrous structure. It is the main constituent of plant cell-walls (only a few fungi).



Cell Wall. Describing the bounding layer of plant cells It is made of cellulose or chitin. It may be changed by secondary deposits of lignin between the cellulose micellae. It imparts mechanical support to the cell.

Cenozoic (Caenozoic). Describing the present era of geological time scale beginning about 65 million years ago during which 4 periods of extensive land elevation occurred which were separated by periods of ocean expansion. Major mountain ranges were formed during it.

Censer Mechanism. A method of seed dispersal in which the seeds are shaken out of pores in the fruit when it sways in the wind.

Central Cell. (1) The cell present in the centre of developing archegonium of the Bryophyta and Pteriodophyta which divides to form the primary canal-cell and primary ventral cell.

(2) The cell present at the base of the archegonium in the Gymnospermae, having the egg and ventral canal-cell.

Central Cylinder. See *Stele.*

Centre of Origin, Theory of. According to this theory, the plant species originated in the area where they show the greatest genetical diversity.

Centrifugal Thickening. Describing the deposition of material on the outside of the cell-wall. It only takes place if the cell is free from its neighbours, *e.g.* the marking on pollen grains.

Centrifugal Xylem. A xylem in which differentiation takes place away from the centre of a stem or root.

Centriole. A central granule present within the centrosome.

Centripetal Inflorescence. See *Raceme.*

Centripetal Xylem. A xylem in which differentiation takes place from the centre of the stem or root.

Centromere. The self-propagating particle in the chromosome whose activity in protein organization determines certain movements of the chromosome.

Centrosome. Describing a minute protoplasmic cell-inclusion associated with the nucleus, and dividing with it. In plants, they are confined to the Thaollphyta.

Cereals. Members of the Graminae whose grain is used for human consumption, e.g. wheat, barley, oats, rye, etc.

Certation. Used for describing the competition between pollen grains, placed at the same time on the same stigma. They have different genetic constitutions ligation giving unequal chances of bringing about fertilization.

Chaetoplankton. Describing small aquatic organisms whose power to float is aided by small spiny outgrowths.

Chalaza. Used for the basal region of ovule where nucellus and integuments fuse.

Chalazogamy. Used for describing method of fertilization in seed plants in which pollen tube enters the embryo sac growing or digesting its way through placenta and chalaza of ovule e.g., in beech, elm and hazed plants.

Chalcones. Used for one of the two groups of anthochlor pigments, about 20 kinds of which are known.

Chamaephyte. A plant which perennates with its buds at or just above the soil-surface.

Character. (1) Any well-defined feature which is able to distinguish one species from another. (2) Genetically, any feature which gets transmitted from parent to offspring.

Chasmogamic. Used for a flower that opens before pollination.

Chasmophyte. A plant which is growing on rocks, rooted in the crevices.

Chemical Fossil. Describing any of the chemicals like alkanes and porphyrins occurring in certain rocks and indicating the presence of life at time of rock formation. Such chemicals provide the only evidence of existence of life of in Precambrian era.

Chemoautotrophic. Used for an organism which derives energy by the oxidation of simple inorganic molecules. An examble is the oxidation of hydrogen sulphide to sulphur by *Thiobacillus* spp.

Chemoheterotroph. Used for an organism obtaining energy from oxidation of organic molecules present in the surroundings and synthesizing organic molecules by use of this energy. All heterotrophs, except photoheterotrophs are chemoheterotrophs.

Chemosterilant. Said of any chemical which is used to sterilize pests and thus reduces the number of offspring in subsequent generations in their populations. Commonly used in biological control of pests..

Chemosynthesis. The formation of organic material by some bacteria by using energy by complex chemical reactions as in respiration.

Chemotaxis. Used for a tactic movement which takes place in response to a chemical stimulus. Becteria commonly exhibit *positive chemotaxis* i.e. swim towards regions of higher concentrations of food materials such as peptone and lactose. *Negative chemotaxis* may be occurring in response to the presence of toxic substances in the surroundings.

Chemotaxonomy. Used for descsibing principles and practices of classifications of plants on the basis of results obtained by application of the principles and procedures of chemical analysis.

Chemotroph. An organism which obtains energy needed for the synthesis of organic molecules from oxidation of inorganic or organic compounds present in its environment without involving light energy in the process (as in chemoautotroph and chemoheterotrophs).

Chemotropism. A tropic movement which takes place in response to a chemical stimulus. For example, pollen tube growth through agar culture towards a piece of implanted pistil exhibits *negative chemotropism* in growing away fron oxygen and *positive chemotropism* in growing towards chemicals exuding from the pistil.

Chernozem(=Black Earth). A grassland soil which is developed under fairly dry conditions so that there occurs little leaching. There is an accumulation of calcium carbonate at about 6 feet.

Chestnut Soil. A grassland soil which is developed under arid conditions. There occurs no leaching, and it carries a shallow-rooting vegetation. The calcium carbonate layer exists near the surface.

Chiasma (pl. Chiasmata). The joint between two chromatids of two homologous chromosomes resulting in an interchange of chromatic material.

Chiasma Interference. Describing of the effectof the occurrence of a crossing over at a point in a pair of chromatids on the chances of second crossing over in the same pair of chromatids. It normally means the reduction of chances of second cross over (*positive chiasma interference*). *Negative chiasma interference*, where there occurs an increase in chances of a second cross over, is rarer.

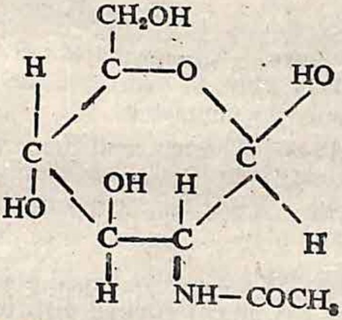
Chimaera. A plant which is having tissues of more than one genetic type. It occurs as a result of the mutation or abnormal distribution of chromosomes in one cell early in development thereby affecting tissues derived from it. It can be produced by grafting different types of plants—a graft hybrid.

Chiropterophilous. Pollinated by bats.

Chi-Squared. Describing the ratio of an observed sum of squares to the appropriate or corresponding variance as fixed by a hypothesis.

Chi-Squared Test. (X^2 test). A test which is commonly used for studying level of correspondence between observed and expected frequencies in an experiment. It is especially used when observations fall into discrete classes. Value of X^2 is found by calculating the (observed frequency—expected frequency)^2/expected frequency for each class of observations and then adding these together. Sum obtained is then checked in a table of X^2 values for different degrees of freedom at various probability levels.

Chitin. A major constituent of fungal cell-walls. It is made up of N-acetyl-2.glucose amine units.



Chlamydospore. A thick-walled asexual spore which is able to survive adverse conditions

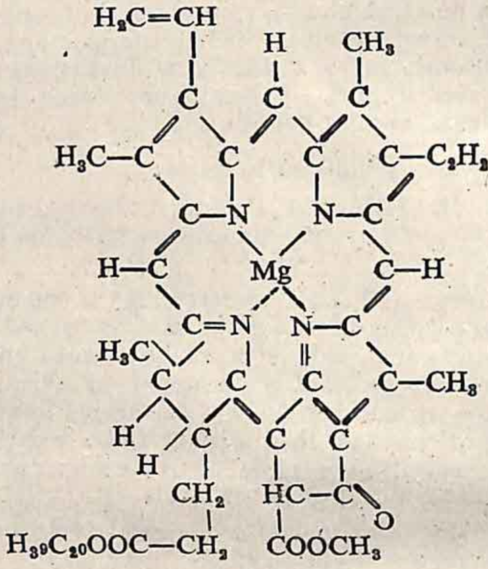
Chlamydozoa. An obsolete phylum which is used to include the viruses.

Chloranthy. Describing an abnormal flower in which all the parts have developed as leafy structures.

Chlorenchyma. Describing tissue of parenchymatous cells having numerous chloroplasts in the cells, and often large intercellular spaces.

Chlorin. A derivative obtained from chlorophyll when it loses the magnesium, phytol and methyl alcohol, and the 5-carbon ring is open.

Chlorophyll. Used for the fundamental green pigment of photosynthesis. It gets localized on the chloroplasts and is made up of chlorophyll *a* ($C_{66}H_{72}O_5N_4Mg$), and chlorophyll *b* ($C_{55}H_{70}O_6N_4Mg$).



Chlorophyll a.

Chlorophoyllase. An enzyme which occurs in association with chlorophyll and is able to hydrolyse the phytol group in the chlorophyll, and hence decompose it.

Chlorophyllins. The two acid precursors of chlorophyll *a* and chlorophyll *b* respectively.

Chlorophyta. A division of the Algae in which chlorophyll is the photosynthetic pigment, and most of them accumulate starch.

Chloroplast. A variously-shaped plastid which is made up of lamellated grana having chlorophyll distributed on them. The grana get interspersed in the non-lamellate stroma. They get embedded in the cytoplasm.

Chlorosis. An abnormal yellowing of leaves with occurs due to the chlorophyll content below the normal. It is caused by a deficiency of certain elements, *e.g.* iron or magnesium, attack by parasities e.*g*. virus yellows, lack of light, drought etc.

Chlorostatolith. A chloroplast having starch, and acting as a statolith.

Chromatid. A half chromosome formed during duplication in early prophase and metaphase of mitosis and between diplotene and the second metaphase of meiosis. After these stages it is termed as a daughter chromosome.

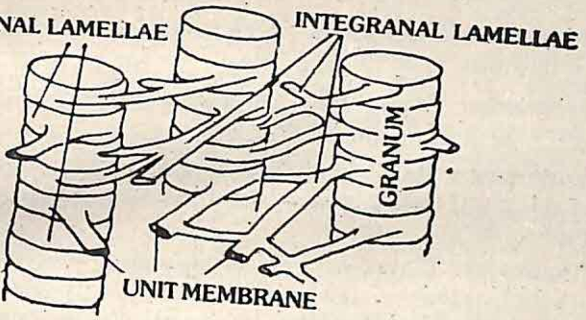


Fig. 3 The arrangement of granal and intergranal lamellae in a chloroplast.

Chromatin. A nucleoprotein forming part of chromosomes. It is made up of two proteins, one of which is histone, and DNA and RNA.

Chromatin Loop. Describing the region of relatively unwounded DNA, about 200 nm in length and extending outwards in a loop from the chromosome. Transcription can take place only in such an uncoiled condition of DNA. These may correspond to genes actively involved in protein synthesis.

Chromatography. A technique used for the separation and identification of components of a mixture of compounds. This mixture is dissolved in the some liquid or gas solvent (*mobile phase*) when solution is allowed to pass through another solid, liquid or gas medium (*stationary phase*). Separation of component substances takes place due to their relative absorption in stationary phase.

Chromatophore. Used for a pigmented lamellar or vesicular structure isolated from disrupted photosynthetic bacteria or blue-green algae.

Chromomere. A particulate portion of chromosome becoming apparent when condensation and contraction of chromatin takes place in meiosis.

Chromoneme. 1. The genetic material of a bacterium. 2. The thread-like structures which are running parallelly along the length of a chromosome and seen in certain stages of nuclear division. (pl. chromonemata)

Chromoplast. A plastid having one or more pigments including chloroplasts.

Chromosome. One of the deeply staining rod-like structures in the cell-nucleus carrying the genes, and having DNA. There is a constant number for any particular species. They undergo a co-ordinated cycle of reproduction during mitosis and meiosis.

Chromosome Aberration. See chromosome mutation.

Chromosome Arm. One of the two parts of a chromosome to which the spindle fibre has been attached along the side.

Chromosome Complement. The set of chromosomes characteristic of a cell of a species.

Chromosome Cycle. The complete changes in the chromosome taking place during the life-cycle.

Chromosome Map. A diagram of a chromosome which shows the position of the genes and is obtained by a statistical analysis of the frequency of crossing-over.

Chromosome Mutation. Describing an alteration in number, order or arrangement of genes which is caused by structural changes in a chromosome. Sometimes it may involve a large number of genes and aberration may be microscopically visible.

Chromosome Number. The total number of chromosomes possessed by a species which is definite for each species, given by haploid number (n) or diploid number (2n).

Chromosome Puff. A swollen region of a polytene chromosome which corosponds to a site where transcription (messenger RNA synthesis) is actively taking place.

Chronistics. Used for the study of time taken for evolutionary events to occur.

Cilliary Body. A basal body in the cell at the basal end o a cilium. *See* kinetosome, flagellum.

Ciliate. Describing a structure which gets fringed with fine hairs.

Cilium. *See* flagellum.

Cincinnus. A monochasium having successive branches borne on opposite sides of the stem.

Circadian Rhythm (diurnal rhythum). Describing the regular occurrence of a phenomenon at 24-hourly intervals. For example, some plants exhibit a characteristic change in leaf position on a daily cycle.

Circinate Vernation. Describing the vernation in which leaf primordium is rolled in on itself from its apical to basal end, towards the adaxial surface so that the apex lies in the middle of the coil. It occurs in most of the ferns (except Ophioglessales), in certain cycads and eztinct seed ferns.

Circumnutation (*Nutation*). The rotation of the tip of a growing stem so that it traces a helical curve in space.

***Cis*-Arrangement** (Coupling). Describing a situation in which an individual is heterozygous for two linked genes (either two units of a function or two mutations in same functional unit) and one chromosome is having both (or mutaht) alleles.

Cisternae. Enclosed spaces in the endoplasm of a cell, which get separated from the ground substance by the cytoplasmic membranes.

***Cis-Trans* Test.** A test to find out whether mutations having similar effects are present in the same or different genes (which are defined as units of functions).

Cistron. A gene defined as a unit of function *i.e.*, a length of DNA which can code for a single protein polypeptide.

Citric Acid Cycle. Used for a process by which acetyl-S.coenzyme A is broken down to carbon dioxide and water during cellular respiration. The process takes place on the mitochondria.

Cladistics. Used for a method of classification in which the relationships between organisms are represented by a diagram or cladogram based on selected shared characteristics.

Cladode. Used for the modification of an internode of stem into a structure which is resembling and carrying out the functions of leaves and where leaves are highly reduced becoming functionless *e.g.*, cladodes of *Asparagus*.

Cladogenesis. Used for the branching of a cladogram.

Cladogram. Branching diagram which represents the relationships between organisms as determined by cladistic methods.

Clamp-Connection (Connexion). An outgrowth from the ultimate cell of a hypha which forms a connection by fusion with the penultimate cell. It is formed during cell-division. They are found in all the Basidiomycetes, except the Uredinales.

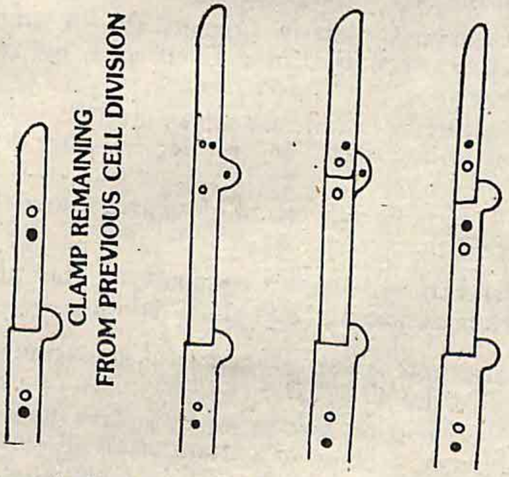


Fig. 4 Stages in the formation of a clamp conection.

Clan. A small group of individuals convering a small area, and derived from the same parent either by vegetative propagation, or from seed.

Classical Genetics (Mendelian Genetics). The branch of genetics dealing with the study of inheritance through observation of the the progeny obtained in breading experiments.

Classification. The process used for establishing and delimiting taxa within the hieararchy o. clases.

Clay. The soil particle derived from weathering of mineral rock during soil formation and having size less than 0.002 mm and consists of alumino-silicates in a latticec structure.

Cleavage Polyembryony. Used for splitting of an embryo into several identical parts, each of which can give rise to a mature embryo. It is found in some gymnosperms and common in *Pinus*. Usually only one embryo develops to maturity.

Cleistocarp. A fungus fruit-body having no special opening.

Cleistocarpic, Cleistocarpous. Used for a moss capsule which does not open by a lid.

Cleistogamy. Used for pollination and fertilization before the flower has opened.

Cleistothecium (cleistocarp). Descring the type of a scocarp which is characteristic of Plectomycete fungi. It is globose having no specialized opening to the exterior.

Climacteric. Increase in rate of respiration in certain fruits during their ripening.

Climacteric Phase. Used for the phase in the life of a fully-grown fruit when the rate of respiration increases.

Climatic Climax, Cloimatic Community. A stable community determined, and maintained in a given area by the prevailing claimatic conditions.

Climatic Factor. A condition such as rainfall, temperature etc. which plays a controlling part in in determining the vegetation of an area.

Climax. The stable vegetation of an area under the prevailing environmental conditions.

Climax Association, Climax Community. The plant association permanently established in any given habitat.

Cline. A morphological or genetical gradation of a species which occurs in a geographical area.

Clinostat. A rotating disk to which a plant gets attached so that it can get an equal amount of a stimulus on all sides. Rotating in a horizontal plane a clinostat is used for studying phototropic responses, and vertically for studying geotropism.

Clone. The entire vegetatively produced descendants from a single original seedling.

Closed (Vascular) Bunddle. A vascular bundle lacking cambium, and cannot increase in diameter by normal secondary thickening:

Closed Community. A plant community completely covering the ground it occupies, and consequently not allowing the introduction of new species.

Club Fungi. Used for a group of fungi based on the structure of basidiocarp in order Aphylloporales of Hymenomecete fungi in which fruiting body has a number of fingers or club-like projections e.g. *Clavulinopsis helvoa*.

Club Mosses Used for pteridophyte *Lycopodium* of the order Lycopodiales of Lycopsida having about 200 species, cosmopolitan in distribution, herbaceous having dichotomously branched stems bearing numerous small leaves arranged spirally on it and having no ligule.

Club Root (Finger-and-toe desease). Used for the disease of crucifers which is caused by fungus *Plasmodiophra brassicae* in which roots get swollen and malformed.

Coacervate (Protobiont). An aggregation of large complex organic molecules bounded by an organic membrane.

Coccus. Any bacterium whose cell is having spherical or elliptical shape.

Cocolith. Used for small intricate plate of calcium carbonate, many of which form complete covering over the cell of certain algae belonging to division Haptophyta.

Cocolithophorids. Used for algal members of division Haptophyta which possess cocoliths over their cells. Such algae are marine and Cretaceous chalks have remains of numerous such algae

Codominance. Used for describing the phenomenon of expression of both alleles of heterozygote in its phenotype.

Codon. Used for a sequence of 3 nucleotides (triplet) which can code for one specific animo acid in a polypeptide chain. Sequence of codons will thus determine the sequence of amino acids in a polypeptide.

Coenobium. A group of algal cells which has a definite number and organisation. It behaves as an individual, often shows polarity, and produces identical daughter coenobia.

Coenocentrum. Used for describing a small deeply staining body at the centre of the multinucleate oosphere of the Peronosporales, to which the egg-nucleus goes.

Coenocytic. Used for a thalloid plant body which is aseptate and multinucleate, structure is often thread-like e.g., hyphae of phycomycete fungi and algae of Xanthophyta.

Coenosorus. Used for the condition where sporangia are in a continuous line as in fern *Pteridium* where discrete sori are not formed.

Co-Enzyme. An organic substance which is essential for the activity of a particular enzyme. The co-enzyme can sometimes be separated from the active group of the enzyme.

Coenzyme I (diphosphopyridine nucleotide) **Coenzyme II** (triphosphopyridine nucleotide). These are dinucleotides having adenine and nicotamide, acting as hydrogen carriers when substances get oxidized by dehydrogenases (See NAD and NADP).

Coenzyme A. A coenzyme which is necessary for the oxidative decarboxylation of pyruvate.

$$\underset{\text{pyruvate}}{CH_3COCOO^-} + CoA + 2H_2O + 2H^+ \rightarrow \underset{\text{acetyl CoA}}{CH_3COO-CoA} + HCO_3^- + H_2$$

also :

Acetyl phosphate + CoA → acetylCoA + inorganic phosphate then :

Acetyl CoA + oxaloacetate → citrate + CoA

Coenzyme Q (Ubiquinone). Used for a lipid soluble electron carrying coenzyme which takes part in transport of electron from NAD to oxygen in the respiratory chain. Molecule is a reversbly reducible quinone.

Cofactor. Used for a non-protein component which is essential for the catalytic activity of some enzyme. It may be a metal ion e.g. zinc ion for alcohol dehydrogenase or a coenzyme.

Cohesion Theory. According to this theory, the reduction in water potential in the leaf due to an increase in the rate of evaporation makes the water to flow through the plant to replace the lost water. This theory explains the ascent of sap in the xylem

Colchicine. $C_{22}H_{25}O_6N$. An alkaloid drug which is extracted from the corm of the autumn crocus *Colchicum autumnale*. It causes abnormal division of nuclei, resulting in an increase of the chromosome number forming a polyploid.

Coleoptile. The first leaf of a grass seedling which appears above the ground first as a sheath around the plumule, and has little chlorophyll.

Coleorhiza, Coleorrhiza. A protective layer of cells which is present around the radicle of grass seedlings.

Coliphage. Any DNA bacteriophage which infects any strain of bacterium *Escherichia coli*.

Collateral Bud. An accessory bud which is lying beside the axillary bud.

Collateral Bundle. A vascular bundle with a strand of xylem, with a strand of phloem external to it on the same radius.

Collecting Cell. A thin-walled cell present in the mesophyll of a leaf below the palisade layer, and in contact with it. The collecting cell transports elaborated food-material from the palisade.

Collective Fruit. A single fruit which is formed from several flowers.

Collenchyma. A mechanical tissue of long cells having cellulose cell-walls thickened at the corners with cellulose. The cells are living and can elongate.

Colonial. Used for a structure made up of numerous cells which are similar in structure and function and more or less loosely aggregated together into the structure of some definite shape. For example, plant body of many algae like *Volvox.*

Colpus. An oblong to elliptical germinal aperture in a pollen grain atleast twice as long as broad. Pollens having such apertures are known as *colpate.*

Columella. 1. Used for the central portion of the root cap of certain roots in which the cells are arranged in longitudinal lines. 2. A rod-like radial element which is present in a pollen or spore wall.

Commensalism. Used for any interaction which is taking place between two different living organisms in which one interacting partner is benefited while other is neither benefitted nor harmed e.g. relationship of epiphyte with their host,

Community. A group of plants and animals that live together and inter act with one another in the same environ mental conditions.

Companion Cell. A nucleated cell having dense cytoplasm, associated with a sieve-tube, with which it is derived from a common parent cell. It apparently plays some role in the functioning of the sieve-tube. Companion cells occur only in Angiosperms.

Comparative Biochemistry. Used for the identification of discontinuities in biochemical variation and their subsequent use in construction of classification or correlation with existing classifications.

Campensation Period. The time required by a green plant to be in light to make-up the carbohydrate which is lost during respiration in the dark.

Compensating Point. Defining as the light-intensity at which the production of carbohydrate by photosynthesis exactly balances that lost by respiration, so that neither carbon-dioxide nor oxygen get relased, or absorbed.

Compensating Tongue, Compensation Strand. A strand of vascular tissue which is passing from one vascular ring to another. It occurs in the siphonosteles of some ferns.

Competence. A characteristice which is exhibited by embryonic cells where they can go on to develop into any one of several different types of cells.

Competition. The struggle occurring between organisms for the necessities of life.

Compital. Where veins intersect at an angle.

Competitive Exclusion Principle. This principle states that in case of interspecific competition for same resources in and area, one species will be able to flourish and exclude the other from the area which will decline gradually. It implies that two different species can not occupy one ecological niche simultaneously.

Competitive Inhibition. Describing the form of enzyme inhibition in which inhibitor substance undergoes competition with the normal substrate of the enzyme for the active site of enzyme. Inhibitor can bind to the active site of enzyme bu can not form products. For example, inhibition of enzyme succinate dehydrogenase by substances such as malonate and oxalate.

Complement. A group of chromosomes derived from one nucleus, and consisting of one or more sets.

Complementary Chromatic Adaptation. The theory, applicable to the Myxophyceae and Rhodophyceae, states that the colour of the light-absorbing pigment is complementary to the colour of the light in which the plant is living. *E.g.* plants growing in blue light are red, while those in red light are green.

Complementary Factor. A factor in inheritance which, with other similar factors results in the appearance of some character in the offspring.

Complemantary Genes. Genes which together produce an effect which is qualitatively distinct from the effect of any of them separately.

Complemantary Society. Used for a community of 2 or more species, that occupy the same area, but not compete with each other *e.g.* they may vegetate at different times, or produce their roots at different levels.

Complementation. Used for the phenomenon in which two recessive mutant strains can fill each other's deficiencies so that both can grow normally. An example is the adenine-requiring strain (ad^-) or histidine-requiring strain (his^-) of fungus *Neurospora* will grow normally when grown together in medium lacking both adenine and histidine but will not grow separately on such medium.

Compost. Used for organic fertilizer of rooted plant material which is obtained from garden rubbish and kitchen vegetable wastes.

Compression Wood. Used for structurally abnormal wood which is formed in response to various stresses in gymnosperms.

Concentric Bundle (centric bundle). Used for a vascular bundle in which one vascular tissue surrounds the other vascular tissue completely so that both appear to be concentrically arranged in transverse section.

Conceptacle. Used for a flask-shaped cavity which is opening outside by a narrow ostiole and present in the thallus of some brown alga *e.g.*, ***Fucus*** inside which antheridia or archegonia are formed.

Conditioned Media. Describing the growth media enriched with growth substances by adding nurse tissue enclosed in a semipermeable membrane.

Conducting Tissue. (Transmitting tissue). Used for specialised thin walled tissue which constitutes the central part of style in some angiosperms through which pollen tube grows down to the funiculus.

2. (Vascular tissue) The tissue in plants conducting water and other materials from one part of plant body to other part. It includes xylem and phloem tissues.

Conduplicate. Folded as certain grass leaves. Term is also used for describing a form of vernation in which each leaf gets folded in U-shape around the next youngest leaf.

Cone. Any of various cone-shaped structures seen in angiosperms *e.g.* aggregate fruits of alders (*Alnus*) and hops (*Humulus*). *See* strobilus.

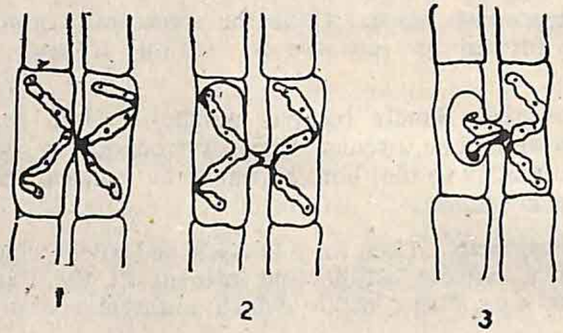
Conidium (Conidiospore, Conidisposrangium). Used for an asexual spore which is produced by many fungi especially Ascomycetes, on specialized erect hyphae (*conidiophores* or *conidiosporaniophores*).

Conjugated Protein. A protein having other components besides polypeptide chains. Such proteins are classified according to the nature of non-peptide portion of molecule. Examples are glycoproteins, lipoproteins, etc.

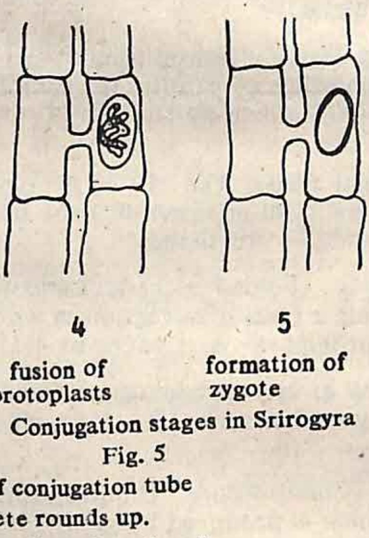
Conjugate Nuclei. Two nuclei in one cell, which undergo division.

Conjugation. (1) The pairing of gametes (usually isogametes) or zygotes ; or the fusion of pairs of nuclei.

(2) The lateral association of chromosomes in the early prophase of meiosis.



begining of conjugation tube
'male' gametes round up
'male' passes through to female'



fusion of protoplasts
formation of zygote

Conjugation stages in Srirogyra

Fig. 5

(1) Begining of conjugation tube
(2) Male gamete rounds up.
(3) Male passes through to female.
(4) Fusion of protoplasts.
(5) Formation of zygote.

Conjugation Tube. A tubular outgrowth which is formed by the fusion of two lateral outgrowths, one from each of a pair of copulating cells. It is through this tube that the male and female (or+and—strains) gametes undergo fusion.

Conjuctive Parenchyma. Parenchyma which is formed between specialized tissue, *e.g.* between vascular strands.

Connate. Used for similar structures that are fused with each other *e.g.*, petals to form a tube.

Connective. Used for the parenchymatous tissue joining the pollen sacs in an anther.

Consociation. An association in which one species becomes distinctly dominant, *e.g.* oakwood.

Consortism, Consortium. Used for the mutual relationship, as taking place between the fungus and alga in a lichen thallus.

Constitutive Enzyme. An enzyme always present in nearly constant amounts in a given cell forming part of the permanent basic cellular mechanism *e.g.*, enzymes of glycolysis.

Consumer. An organism that can not synthesize its own food by use of energy available in its environment but feed on some other organism(s).

Contact. Generally used as an insecticide or herbicide which can kill an insect or plant by contact only rather than relying on absorption or ingestion *e.g.*, DDT and and pyrithrin (insecticides)

Continental Drift Theory. According to this existing continents moved to their present positions after breakup of an ancient landmass *Pangaea* during Mesozoic era.

Continuous Variation. Slight variation between a number of individuals of the same lineage, so that the differences grade into each other.

Contorted. Said of sepals and petals in the bud, twisted so that they overlap on one side only.

Contorted Aestivation. Used for the arrangement of the perianth in the bud, when all the perianth segments overlap by either their right-hand or left-hand edges.

Contractile Root. A rather fleshy root, which becomes transversely corrugated as it ages, thus shortening, and dragging the the plant deeper into the ground.

Contractile Vacuole. A cavity in cytoplasm which is surrounded by a membrane and filled with water. It is found in many freshwater unicellular organisms.

Convergent Evolution (convergence). Used for the evolution of analogous structures in unrelated groups of organisms as a result of response to their similar environmental conditions *e.g.*, insectivory in families Nepenthaceae, Sarraceniaceae and Droseraceae. *See also* parallel evolution.

Coppicing. Describing the woodland management in which trees are cut back to ground level regularly every 10-15 years for encouraging growth of numerous adventitious shoots from the base.

Coprophilous. Used for an organism living on or in dung *e.g.*, fungi of Pilobolaceae.

Cordaitales. An order of the Coniferopsida. They were tall woody trees of the Carboniferous era. The leaves were slender and simple, and the inflorescence was a loose cone.

Cordate. Used for a strtucture that is heart-shaped *e.g.*, leaf of *Viola odorata* or the lemmas of *Briza* gr sses.

Coriaceous. Used for a structure having a leathery texture.

Cork. A layer of suberized, dead cells which are cut off by a phellogen on the outside of the stem or root of a woody plant. The layer is protective and impervious to gases and water vapour. It replaces the epidermis.

Cork Cambium. See *phellogen*.

Cork Wood. A wood of low specific gravity, due to the presence of many large thin-walled parenchymatous cells.

Corm. (1) A bolbous swollen stem base which is bearing scale leaves and adventitious roots. It is a storage organ, and acts as a means of vegetative propagation.

(2) The bulbous stem of *Isoetes*.

Cormophyte. A plant having a stem, root, and leaf.

Corolla. A collective term for the petals of a flower.

Corolla Tube. A tube-lik structure which is formed by petals *i.e.* by fusion of petals together by their margins as in *Catharanthus roseus*.

Corona. (1) A trumpet-like outgrowth of the perianth, e.g. of a Daffodil.

(2) A ring of leafy outgrowths from the petals.

Corpus. Describing the main body of a winged (bladdered). pollen grain as in many conifers.

Correlative Inhibition. Describing the suppression of growth of a plant part by a compound (such as food substance or growth substance) which is produced in some other area of the same plant.

Cortex. (1) The tissue in a stem or root which is present between the vascular bundles and the epidermis. Typically it is parenchyma. (2) The outer layer of slightly thickened, closely packed cells of the thallus of some brown and red algae, fungi, and lichens.

Corymb. A raceme in which the lower flower-stalks are longer than those above, so that all the flowers are at the same level.

Cosmopolitan. Used for a species that has worldwide distribution and not restricted to any specific area only.

Costa. (1) A general term for a midrib or vein.

(2) The midrib of the thallus of a liverwort.

(3) A rib or valve of a diatom.

Cotyledon. (1) The leaf which is formed directly from the embryo of an angiosperm or gymnosperm, There may be one (in monocotyledons) two (in dicotyledons), or several (in gymnosperms). They act as storage organs in non-endospermous seed, and as the first photosynthetic organs in endospermous seeds. It may be an absorptive organ in certain seeds, *e.g.* the Graminae.

(2) The first leaf which is developed from the embryo sporophyte of the Pteridophyta.

Coumarin. A lactone of *o*-coumaric acid which is responsible for the odour of sweet vernal-grass, and tonka beans used in perfumery.

Coupling. Used for the presence of two given genes in the same chromosomes in a double heterozygote.

Covered Smuts. Used for plant diseases which are caused by certain fungi (*Ustilago xordei*) in which masses of spores are produced that remain within the sorus for a while, often until after the dispersal of sori from the host.

Cradina. An enzyme able to break down proteins, present in the juice of stems, leaves and fruits of figs.

Craspedodromous. A from of leaf vention having single primary vein which is running down the centre of leaf with secondary veins branching off from it in an essentially parallel manner. In traditional terminology, it is called penni-parallel. Example is leaf of *Castanea sativa.*

Crassula. A horizontal rod or band of thickening, which consists of pectic materials, or cellulose, and occurs between pits in the walls of tracheids and vessels.

Crassulacean Acid Metabolism (Cam). A photosynthetic pathway which was first described in family Crassulaceae and found in many other succulent plants. In plants with CAM, stomata only open in the night. Therefore, CO_2 can enter the plant only in the night and then it cannot be fixed due to lack of sunlight so it reacts with phosphoenol pyruvate to form oxalacetate which is converted to malic acid that is stored in cell vacuoles until daytime. In daylight, malic acid gets transferred to cytoplasm, broken down to give CO_2 again within the cell and now this gets fixed by dark fixation reactions as occurring in case of photosynthesis normally.

Creationism (special creation theory). Used for the view of origin of life which is opposed to evolutionary. According to this theory all organisms, living and dead have been especially designed by a Creator.

Cremocarp. A schizocarpic fruit developed from bicarpellary, syncarpous, inferior ovary and is bilocular and two seeded. At maturity, it splits into two one-seeded and one-chambered *mericarps* along the carpophore. *E*.g., fruits of umbelliferae.

Crenate. Used for a leaf margin that has rounded projections.

Crenulate. Used for leaf margin which is having rounded projections like crenate but the projections are much smaller in comparison.

Criss-Cross Inheritance. This occurs when all the male offspring of a cross have a character shown only by the female parent, and all the female offspring have a character shown only by the male parent.

Crista. (1) A ridge-like membrane which is running the length of some bacterial cells.

(2) Paried membranes which are found in mitochondria, and separated by cisteria-like spaces. They may be branched.

Critical Dark Period. Used for the mimimum length of time of continuous darkness specific for a species, that will keep flowering in a long-day species inhibited or that is necessary for initiating flowering in a short-day species.

Critical Daylength. Used for the minimum length of time of daylight exposure which is specific and is necessary to initiate flowering in long-day species or inhibit flowering in a short-day species.

Critical Point Drying. A technique used for removing water from biological specimens without causing shrinkage or collapse.

Cross. (1) The act of fertilization which is taking place between two individuals of different breeds or races. (2) An individual produced by such a fertilization.

Cross Breeding. See *Cross* (1). Applies particularly when it is carried-out deliberately by man.

Cross-Fertilization. Refers to the fertilisation of female gamete of one individual by the male gamete of another individual.

Cross Field. In radial longitudinal section of gymnospermous wood, cross field represents the area in which walls of ray cells abut onto those of axial tracheids. This region is usually pitted and form of these *pits in the field* (*cross-field pits*) is a characteristic of a genus or group of genera.

Crossing-Over. Used for describing the exchange of corresponding segments of two chromatids of homologous chromosomes during meiosis. This takes place by the breaking and reunion of the chromatids, and results in the independent segregation of the the genes.

Cross-Over Unit. A 1% frequency of interchange which is taking place between a pair of linked genes.

Cross-Over Value. The percentage of gametes showing crossing-over of a particular gene.

Cross-Pollination. Used for the transfer of pollen from the anther of one individual to the stigma of another.

Cross Protection. Used for protecting a young plant from virulent strains of a virus by inoculating it with mild strain of that virus. This procedure finds use in controlling tobacco mosaic virus and citrus tristera virus.

Crown Gall. A gall disease which is caused by soil borne bacterium *Agrobacterium tumefaciens*. Galls are produced below and above ground on a wide range of hosts, particularly fruit trees.

Crozier. The hook which is formed by an ascogenous hypha previous to ascus development.

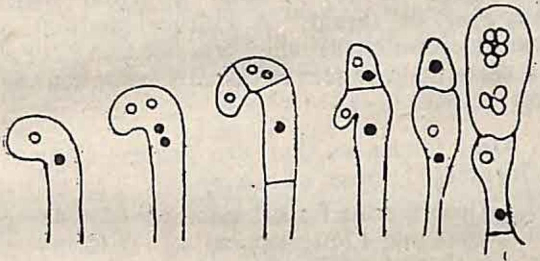


Fig. 6 Stages in crozier formation.

Csyptantherous. Used for stamens which are enclosed within the flower.

Cryptogams. Used for describing plants in which the method of reproduction is not immediately apparent i.e., in which reproductive structures are not borne conspicuously in flowers or cones, e.g., algae, fungi, bryophytes.

Cryptomere. A genetic factor which is not seen.

Cryptomerism. A failure of characters to show in the offspring, which nevertheless has the corresponding hereditary factor.

Cryptophyte. A plant forming dormant buds below the soil-surface.

Cryptoplasm. That part of the cytoplasm that appears to lack granules.

Cryptopodsol. A soil which does not appear to be a podsol but can be shown to be so by chemical analysis.

Cryptostoma. A flask-shaped cavity in the thallus of some of the larger brown algae. It is having mucilage-secreting hairs.

Culm. Used for the jointed stem of members of family Graminae and Cyperaceae. In grasses, it is normally hollow or rarely with pith. In sedges, it is normally solid and triangular in cross section.

Cultivar. Any variety or strain which is produced by horticultural or agricultural techniques but not normally occurred in nature e.g., any cultivated variety.

Culture. Used for the growth of organisms, especially microrganisms, under clearly defined conditions which are usually artificial. Such methods may be employed experimentally, e.g., with fungi and bacteria, or horticuturally, e.g. with mushrooms and tomatoes.

Culture Medium (nutrient medium). A mixture of nutrients which is used to support the growth of a culture of microorganisms, cells, tissues organisms. It may be solid if mixed with a gelling agent (commonly agar) or liquid. A culture medium must have all the micro and macronutrients which are necessary for the growth of culture and a carbohydrate source (usually supplied as sucrose) is also necessary.

Cuneate. Used for leaves that are wedge- shaped with the point of wedge forming the base of lamina.

Cup Fungi. Used for the fungal members of order Melotiales (having some 90 genera and 1750 species) of Discomycetes which from somewhat cup-shaped ascocarp.

Cupule. (1) A depression present on the surface of the gametophyte of some Marchantiales, the cells of which produce the gemmae. (2) A cup which is surrounding the fruit of some trees.

Cushion. Used for the central portion of the prothallus of a fern. It is several cells thick and bears rhizoids and sex-organs.

Cusp. A sharp point, as on teeth.

Cuspindate. Having a rigid point.

Cuticle. A non-cellular waxy layer which is secreted by the epidermis. It protects the surface and reduces water-loss.

Cuticular Diffusion. The passage of gases which takes place through the cuticle of a plant.

Cutin. Used for the substance of plant cuticle deposited on, or in, the outer layer of cell walls. It is produced by the oxidation and condensation of fatty acids.

Cutting. Used for method of vegetative propagation, in which pieces of stems or roots are planted, and develop into new plants.

Cyanocobalamin (vitamin B_{12}). Used for a complex molecule which has a corrin ring (similar to a porphyrin ring) and a ribonucleotide. Corrin ring has a cobalt atom which gets bonded to a cyanide group and to the ribonucleotide. It is not produced by plants or animals and is obtained from *Streptomyces olivaceus.*

Cyanogenesis. Used for the production of cyanide glycosides by certain plants e.g., *Prunus l aurocerasus, trifolium repens* etc.

Cyanophycin. Used for food reserve characteristic of algae that belong to Cyanophyta.

Cyathium. A specialized cup-shaped inflorescence of members of Euphorbiaceae which resembles a single flower and consists of a simple female flower in the centre surrounded by a number of naked male flowers and all these are enclosed involucre of bracts. Involucre also bears a number of glands along its rim.

Cyclosis (cytoplasmic streaming). The movement of cytoplasm which is taking place within the cell due to cytoplasmic viscosity as a result of change in nature of protein, specially the actin.

Cyme. An infloresence in which the terminal bud is a flower-bud, i.e. it is a sympodium, and any subsequent flowers are formed in a similar way at the ends of lateral branches.

Cypsella. Used for the type of fruit that is dry and indehiscent. It develops from bicarpellary, syncarpous, inferior ovary and is unilocular with pericarp separate from the seed coat.

Cyst. Any thick-walled resting spore.

Cystocarp. A swollen, urn-shaped fruiting body which occurs in some red algae e.g., *Polysiphonia.* It is formed after fertilization of carpogonium.

Cystolith. A large intracellular structure which is formed by deposition of lime on an ingrowth of cell wall e g., in plant of *Ficus elastica* and *Urtica dioica.*

Cytochrome. Any iron-porphyrin having electron carrying proteinaceous pigment that forms part of electron transport chains of respiration or photosynthesis. Porphyrin presthetic group has a chelated iron ion which changes from ferric to ferrous during reduction and vice-versa during oxidation.

Cytogenetics. Refers to the application of cytological techniques to the problems of inheritance particularly the study of chromosome structure and its relation to phenotype.

Cytokinesis. Refers to the process of cytoplasmic division which follows karyokinesis. As telophase continues, a cell plate is formed in the cytoplasm in the equatorial region of spindle and thus cell gets divided into two daughter cell, each having a daughter nucleus.

Cytokinin (kinin). Used for any of a group of growth substances which primarily stimulate cell division. The effect occurs only in association with auxin. Different proportions of auxin and cytokinin may induce different types of meristematic activity.

Cytology (cell biology). The branch of biology dealing with the structure, organisation and functioning of cell and its material.

Cytomixis. Used for describing apparent migration of cytoplasm and nuclear material from one pollen mother cell to another through pores (cytoplasmic channels) in the cell walls. It takes place prior to and during the prophase stage of meiosis.

Cytopharynx. Describing a narrow passage which is arising from the base and upto the surface in the gullet of euglenoid cells.

Cytoplasm (hyaloplasm). Used for the part of protoplasm excluding nucleus, soluble phase, but having principle components of cell including cisternal elements and membrance-bound organelles, biochemical pathways, storage products in its matrix.

Cytoplasmic Inheritance (exra chromosomal inheritance). Used for the determination and inheritance of a characteristic by genes present in the cytoplasm (plasmagenes). Expression of such characters does not relate to behaviour or movement of chromosomes and so their inheritance does not follow Mendelian laws.

Cytoplasmic Streaming. *See* cyclosis.

Cytosome. Used for the opening of cytopharynx to the exterior in gullet of euglenoid cell.

Cytotaxonomy. Describing the number, structure and behaviour of chromosomes in taxonomic work. Chromosome number of karyotype forms the most specific taxonomic character.

D

2, 4--D. A synthetic auxin called 2, 4-dichlorophenoxyacetic acid. It is used as weed-killer.

Damping Off. A disease attacking young seedlings at ground level causing them to rot and fall over. It is usually caused by species of the fungus *Phythium*, and is favoured by overcrowding in damp conditions.

Dark Seed. A seed which will germinate, only when kept in the dark, when other conditions would normally favour germination.

Dark Reactions. The sequence of light-independent reactions utilising the energy in the form of ATP and reducing power in the form of NADPH which are formed during the light reactions to reduce carbon dioxide.

Darwinian Theory, Darwinism. See *Natural selection.*

Dating. Said of the determination of the age of rocks, minerals and organic matter. Organic materials may be dated by radiocarbon-dating and dendrochnorlogy. However, these methods can be used only for specimens of later part of quaternary period. Dating of older rocks rely on radiometric dating.

Dauer Humus. Humus which is resistant to the attack of micro-organisms.

Dauermodification. A lasting inheritable change which is possibly cytoplasmic, and is produced by some treatment.

Daylength. *See* critical daylength.

Day Neutral Plant. Describing a plant without definite photoperiod *i.e.* it can flower regardless of the length of exposure to daylight or darkness each day.

Day Position. The situation adopted by leaves of plants during the day, if they alter this position when the light intensity decreases.

Day Sleep. Used for the folding of leaflets of a compound leaf in bright light. This brings the stomatal surfaces together, thereby reducing the water-loss.

Deamination. Used for the removal of an amino group from a compound. Amino acid breakdown takes place by oxidative deamination. For example, the deamination of glutamate by enzyme glutamate dehydrogenase yields α-ketoglutarate, NH_4^+ and reduced NAD or NADP.

Decarboxylase. Any enzyme catalysing the removal of carbon dioxide from a substrate *e.g.*, pyruvate decarboxylase catalysing the formation of acetaldehyde from pyruvate.

Deciduous. Used for describing woody perennial plants that shed their leaves before the winter or ary season.

Decomposer. Describing an organism that feeds on dead organic matter deriving energy by its breakdown to simpler substances *e.g.*, many bacteria and fungi.

Decompound. Describing a compound leaf, when the leaflets are made up of distinct parts.

Deconjugation. Used for the separation of chromosomes before the end of prophase of meiosis.

Decumbent. Lying flat, or being prostrate, but having the tip growing upwards.

Decurrent. (1) Of a leaf whose base is extending down the stem as two wings. (2) Of the gills of an agaric when they run some distance down the stipe.

Decussate. Describing leaves, when they are opposite, but each pair is at right angle to the ones above and below it.

Dedifferentiation. Used for the reduction of the cells of a differentiated tissue to a common undifferentiated form.

Dediploidization. Used for the production of haploid cells (or hyphae) from a dikaryotic diploid cell (or mycelium).

Deficiency. Used for the loss of a terminal acentric segment of a chromosome. Sometimes used to include 'deletion'.

Deficiency Disease. An abnormality which is caused by the absence of an essential chemical element.

Definite Growth. Describing the form of growth in which growth of the part is stopped after a certain maximum size is reached.

Definite Ineflorescence. *See* cymose inflorescence.

Definite Variation. A change which is taking place in a definite direction in the history of a race.

Definitive Nucleus. The diploid nucleus present in the centre of embryo sac formed after the fusion of two haploid polar nuclei. One male gamete from pollen tube fuses with it to form triploid primary endosperm nucleus.

Deflexed. Used for a structure that is bent sharpely downwards.

Degeneration. (1) The change from a complex to a simpler form during evolution. (2) The loss of morphological or physiological features by a fungus or bacterium kept in culture.

Degree of Freedom. A comparison of items within a body of data, independent of any other comparison used in the analysis. The number of degrees of freedom represents the number of independent comparisons which can be made within the body of data.

Dehiscence. Used for splitting of certain plant organs along predetermined lines for releasing their contents as in anthers, spore capsules and fruits. It is usually caused by gradual drying out of the enclosing walls.

Dehydrase. An enzyme catalysing the removal of water, *i.e.* condensation, *e.g.*,

$$2C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O.$$

Dehydrogenase. An enzyme catalysing the removal of hydrogen, and by so doing oxidizes the substrate.

Dehydrogenation. A biological oxidation, involving dehydrogenases, when hydrogen is removed from a donor, which gets oxidized, to a receptor which gets reduced, *e.g.*,

$$AH_2 + B \rightarrow A + BH_2$$

Delayed Inheritance. When each successive generation is having the genotype of the female parent for a particular character.

Deletion. Describing the loss of an intercalary acentric sigment of a chromosome.

Delignification. Describing the destruction of lignin in wood by a fungus.

Deliquescence. (1) Used for the softening and liquefying of a sporangium membrane etc. at maturity. (2) Used for a stem that breaks into separate branches.

Denaturation. Reducing the solubility of a protein, by altering its structure, chemically or by heating.

Dendritic. (1) Much branched.

(2) Having markings which are tree-like or moss-like.

Dendrochronology. Used for a method of dating historical events by making use of annual growth rings of old trees. Dating of archeological sites by cross-dating is achieved by doing comparison between timber at the site and small samples of cores of very old living trees there. Year of timber felling can be known by finding the point at which ring patterns of both correspond. In absence of sufficiently old trees in the area, chronologies are built up successively further back by matching the type of ring patterns of a number of wood samples with overlapping ages.

Dendrogram. A branching generally rooted diagram which reflects the relationships of a group of taxa. It is possible to represent the taxonomic hierarchy in a kingdom with kingdom at the base and subform as the terminal branches.

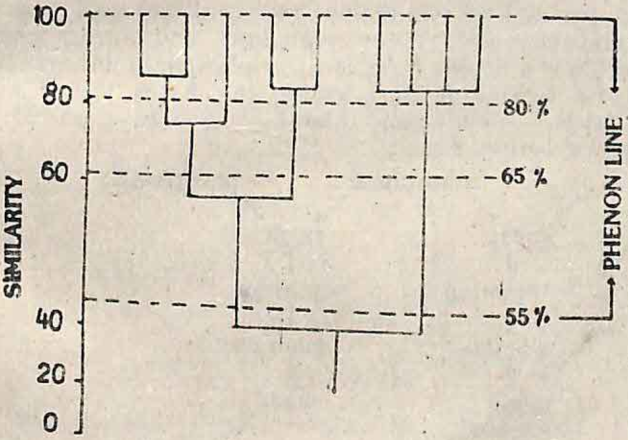


Fig. 7

Dendrograph. An instrument used to measure the periodic shrinking and swelling of tree trunks.

Denitrification. Used for the decomposition of nitrates in the soil by *Bacterium denitrificans*, resulting in the production of nitrogen.

Denitrifying Bacteria. A group of soil bacteria which break down nitrites and nitrates anaerobically to evolve nitrogen.

Density Gradient Centrifugation. A technique which is used for separating and isolating pure samples of cell organelles. In this technique cells are first broken down in a homogenizer to release the contents and then the homogenate is filtered to remove cell fragments. It is now allowed to pass through prepared salt or sucrose solutions of different concentrations which are layered according to their density in a glass tube. Application of appropriate centrifugal forces, causes banding together of cell inclusions at regions in density gradient that corresponds to their own density and then these get separated off by various methods.

Denizen. A species of plant which could maintain itself in the wild, but was probably introduced by man.

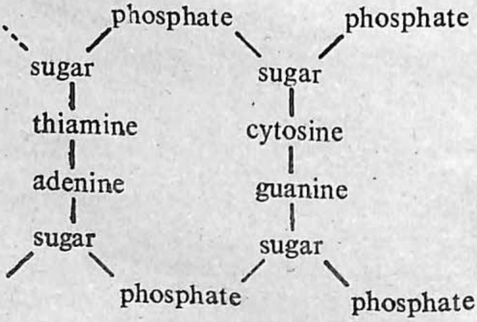
Dentate. Used for describing leaf- margins that are toothed with outward pointing notches. These are different from denticulate only in having less fine tooths.

Denticulate. Describing leaf-margins that are finely toothed with outward projecting notches.

Deoxynucleoside. A 2-desoxyribose sugar having adenine, guanine, cytosine, or thymine attached to it. A base unit of nucleic acid.

Deoxyribonucleotides. The products of hydrolysis of DNA.

Deoxyriboseuucleic Acid (DNA). The hereditary material of the cell. The molecule has deoxyribose (a sugar), phosphoric acid, two pyrimidines (thiamine and cytosine) and two purines (adenine and guanine). The pyrimidines and purines form bases. The molecule is a double helix of sugar-phosphate linkages (forming the sides of a twisted ladder) having the bases joined across to form the rungs. Adenine and thiamine are always paired, as are guanine and cytosine. *E.g.*



Dermatogen. The external layer of a stem or root apex, one cell thick, and giving rise to the epidermis.

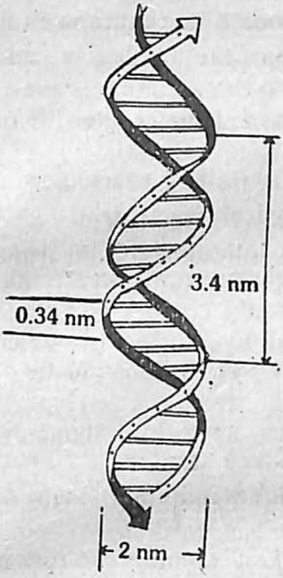


Fig. 8 Dimensions of the DNA double helix.

Dermatophyte. A parasitic fungus causing a disease of skin, hair, or nails.

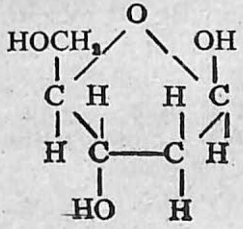
Dermatosome. One of the small pieces into which a cell wall can be resolved by prolonged treatment with dilute hydrochloric acid, followed by heating at 50-60°C.

Desert. A major type of regional community in areas of low rainfall and supporting little or no vegetation. *True deserts* are regions which are devoid completely of higher plant life. *Cold deserts* include tundra and regions which are permanently covered with ice and snow. *Hot deserts* are having annual mean rainfall under 250 mm. Plants generally are few, usually small and sparsely distributed.

Desmids. Used for unicellular members of class Zygnemaphyceae of Chlorophyta that are characterised by their distinctively symmetrical cells, anatomically complex plastids and absence of free swimming swarmers and reproduction by conjugation. These are of two types; *saccoderm desmids* commonly occurring in acidic pools and peat bogs and *placoderm desmids* (or *true desmids*). The cells of placoderm desmids are characteristically splitted up into two virtually identical halves, joined by a narrow bridge at the centre.

Desmolases. Enzymes breaking, or forming a C-Clink, without hydrolysis *e.g.*, Carboxylase catalyses the change of pyruvic acid to acetaldehyde and carbon dioxide.

Desoxyribose. A pentose sugar, having the following structure ;



Desoxyribose Nucleic Acid. See deoxyribose nucleic acid (DNA).

Desynapsis. The abnormally early breaking of synapsis in meiosis.

Deutobroque. A stage which is proceeding leptotene in oogenisis. The chromosomes radiate from the nucleolus and wind about just under the nuclear membrane.

Development. Used for the succession of stages in the life of the plant, as distinct from simple growth.

Devonian. A geological period 310-270 million years ago.

Dextrinase. A plant enzyme which hydrolyses dextrin.

Dextrins. A series of polysaccharides intermediate in structure between glucose and starch, with 5-10 glucose units in straight clains. Formed during starch hydrolysis.

Dextrose. A hexose sugar (D-glucose), a solution of which rotates a beam of polarized light to the right. The former name of glucose.

Diadelphous. Describing stamens which have the filaments, either in two bundles or in a group with one free stamen.

Diadromous. Said of venation which is resembling the ribs of a fan

Diageotropism. The growth of a plant member so that it becomes at right angles to the gravitational field.

Diakinesis. The last stage in the prophase of meiosis in which the nuclear membrane and nucleolus disappear and the bivalents become more contracted, the chiasmata tend to move to the ends of the chromosomes, and the tetrads pass on to the spindle.

Diallele Cross. A breeding experiment in which each of a number of males is made to cross with each of a number of females.

Dialysis. A process of separating small particles (ions or small molecules) from big ones (colloids or large molecules) in solution. This is carried out by placing the' mixed solution in a membrane which has pores large enough for the small molecules to pass through, but which obstruct the passage of the larger ones (*e.g.* cellophane, collodian, parchment). It is then placed in water, and the smaller particles diffuse out into it.

Diaphototrophic. Used for a plant member which grows into a fixed position across the direction of incident light.

Diaphragm, (1) A transverse plate of cells across a stem, generally at the nodes. (2) A cross-partition in the air chambers of hydrophytes, generally perforated.

Diarch. Having two strands of xylem.

Diaschistic. Used for tetrads which divide once transversely and once longitudinally, in meiosis.

Diastase. An enzyme complex which breaks down starch to glucose. See *Amylase.*

Diaster. In cell division, when the daughter chromosomes are situated in two groups near the poles of the spindle and ready to form the daughter nuclei.

Diastole. The growth and epansion of a nucleus from the end of one mitosis to the beginning of the next.

Diatoms. Used for unicellular or colonial non-flagellate algae of Bacillariophyta which have delicately sculptured silica cell walls divided into two overlapping halves (*see* frustule). These may be radially symmetrical (*centric diatoms*) or bilaterally symmetrical (pennate diatoms). Cell walls are extremely resistant to decay and form diatomaceous earth (kieselguhr) in lake or ocean beds.

Diatropism. The growth of an organ or organism so that its axis becomes at right-angles to the line of action of the stimulus.

Dicaryotic. *See* dikaryotic.

Dichasium (dichasial cyme). A cymose inflorescence in which apecies are developed into flowers and two lateral flowers are developed below each apex from axillary buds of common node. This gives symmetrical appearance to the inflorescence as in *Stellaria holostea*. *Compare* monochasim.

Dichogamy. Used for describing the maturing of the anthers and ovules in the same flower at different times.

Dichopodium. A sympodial branch system which is made up of successive parts of a dichotomizing branch system, of which only one of part is assisting in forming the axis.

Dichotomous. Forked branching which is produced by the subdivision of an apical meristem, to form two branches of the same size. It is a primitive form of branching.

Diclinous. Unisexual. Male and female organs are borne on different plants.

Dictyotome. See *golgi apparatus*

Dictyospore. A multicellular spore divided by transverse and longitudinal walls.

Dictyostele. A siphonostele having overlapping leaf-gaps. This gives distinct vascular strands called meristeles. The whole is enclosed by an endodermis.

Didymous. Used for describing arrangement of anthers in two equal pairs in the androecium.

Didynamous. Used for the condition of stamens in androecium in which there are two long and two short stamens *e.g.*, in Labiatae.

Differential Centrifugation. Used for describing a method of isolating cell organelles. This method involves the breaking up of cells in homogenizer, followed by filtering the homogente to separate cell fragments and then certifuging it and decanting several times in sequence with increasing the time and speed of certifugation at each successive stage. Nuclei, membranes and ribosomes have been collected in that order.

Differentiation. The process in which a cell divides to give rise to dissimilar tissues within an individual. The process is repeated by heredity, and is therefore genetically determined.

Diffuse Nucleus. The chromatidia sometimes present in non-nucleated cells.

Diffuse Porous. When the vessels are scattered evenly throughout the xylem, or when there is little difference in the size of the vessels formed in different seasons.

Diffuse Porous Wood. Used for describing secondary xylem in which diameter of tracheary elements show no or very little seasonal variation as the wood of *Betula lutea*. Such woods lack discernible growth rings.

Diffusion Pressure Deficit (DPD). The osmotic pressure of a solution particularly when comparing it with that of another solution, *e.g.* a comparison of the osmotic pressure of the cell-sap, compared with that of the surrounding medium. It is calculate by DPD (diffusion pressure deficit)=OP [osmotic pressure]—TP (turgour pressure.)

See also osmotic pressure, turgour pressure, water potential.

Digitate. *See palmate.*

Digitaliform, Digitate. Diverging from a central point, like the fingers on a hand.

Dihybrid. An organism that is heterozygous for two particular [genetical] factors (genes). It is produced by a cross taking place between parents that are homozygous for the two factors in consideration. For example, a cross taking place between homozygous parents (AABB × aabb or AAbb × aaBB) result in dihybrid AaBb. Dihybrid has expression of dominant allele for factors in considerarion. *See also* monohybrid, trihybrid.

Dihybrid Ratio. A 9:3:3:1 ratio of phenotypes among the offspring of a single cross. This ratio can result only if a Mendelian cross has involvement of two factors, both involved factors are assorted randomly and independently and both parents arc heterozygous for both the factors in consideration. If dihybrid (e.g., AaBb) is salfed i.e., crossed with other similar dihybrid (AaBb × AaBb) and there occurs complete dominance of one allele of both factor, fertilization is random and all gametes, zygotes and offspring are having equal chances of survival, such a phenotype ratio occurs among the offspring. It is an expression of monohybrid Mendelian ratio viz. $(3:1)^2$. If in an experiment which should give such a ratio,some deviant ratio is observed, it reveals that some of the basic assumptions, singly or in combination, are not being applicable in the particular case.

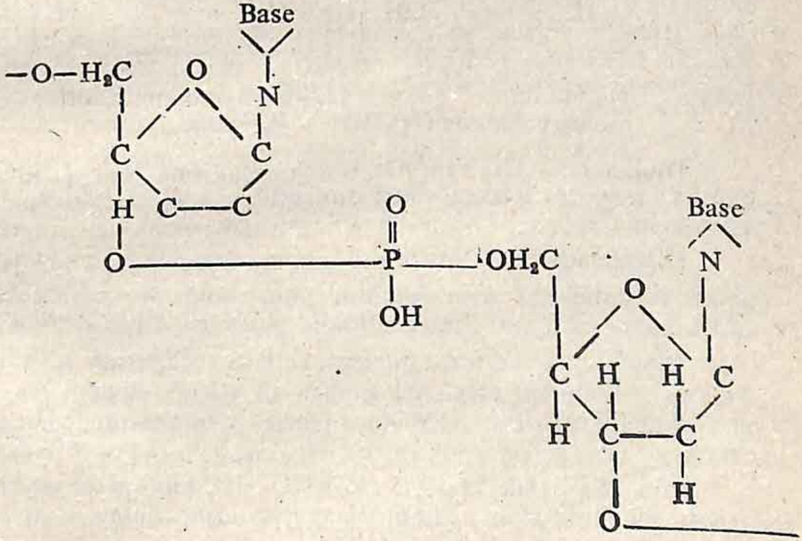
Dikaryotic. A plant thallus (the fungus mycelium of Basidiomycetes) in which each segment is having two genetically distinct nuclei. Such mycelium is formed from fusion of two monokaryotic mycelia of different strains.

Dimerous. Used for a flower in which number of units in each whorl is two or its multiple e.g., in *Ciracaea.*

Dimorphism. Said of the phenomenon in which an individual has an organ in two morphologically distinct forms (e.g., chloroplasts in mesophyll and bundle sheath cells of C_4 plants) sun and shade leaves or juvenile and adult leaves, gametophyte and sporophyte plants of a species or male and female individuals (*sexual dimorphism*) etc.

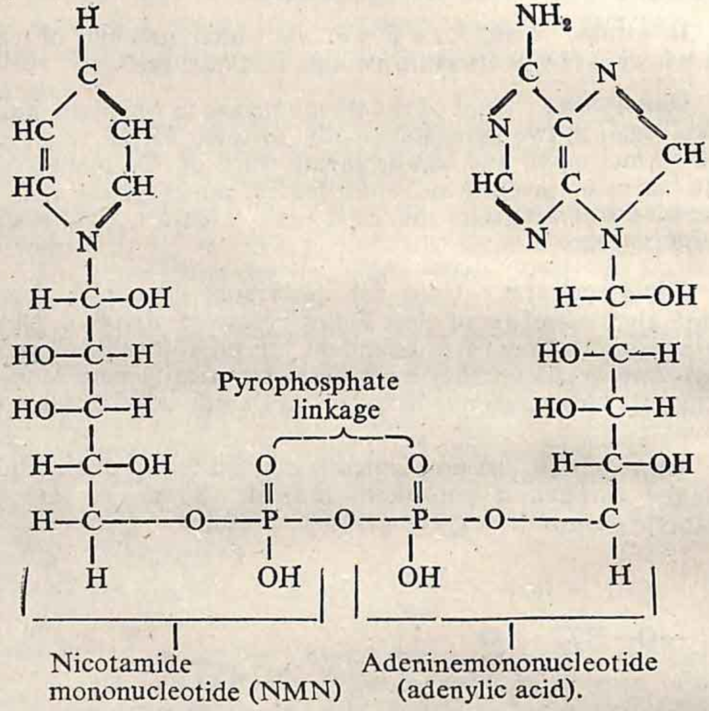
Dinoflagellates. Used for describing flagellate, unicellular, marine algal members of class Dinophyceae of division Dinophyta (Pyrrophyta). They are abundant in phytoplankton and often dark-brown in colour, they have characteristically one longitudinal and one transverse groove in the cell wall and two flagella in each groove.

Dinucleotide. A unit which is derived from deoxyribose and is linked through a phosphate radical. Some are important as prosthetic groups of enzymic globular proteins.



Dioecious. Used for describing plants in which male and female reproductive organs are situated on two different individuals. This makes cross fertilization obligatory in sexual reproduction.

Diphosphopyridine Nucleotide (DNP) (Coenzyme I). Trivial name for NAD. A coenzyme which gets oxidized and reduced during the early stages of respiration. The pyridine ring is the active group. It oxidizes glyceradehyde-3-phosphate to 3-phosphoroglyceric acid by removing hydrogen.



Diplanetic. Used for describing organisms that produce two type of zoospores (planospores) successively e.g., certain species of *Saprolegnia*.

Diplobiontic. Used for describing life cycle in which diploid phase is dominant over haploid phase and there are two vegetative resting structures in the diploid phase e.g., life cycle of ferns.

Diploid. Used for a nucleus, cell or organism with double the haploid number of chromosomes in it, its nucleus or nuclei of its somatic cells respectively. Generally represented by symbol 2n.

Diplontic. The life-cycle in which the diploid phase in life-cycle is dominant over its haploid phase, latter being restricted to gametes only e.g., life cycle of diatoms and numbers of Fucales.

Diplospory. A form of apomixis in which spore mother cell directly gives rise to embryo e.g., in *Antennaria.*

Diplosome. A paired heterochromosome ; a double centrosome is lying in the cytoplasm.

Diplostemonous. Having two whorls of stamens, each having the same number as there are petals, and the outer whorl alternating with the petals.

Diplotene. The stage in meiosis when the chromatids become obvious, and the homologous chromosomes start separating.

Disaccharide. A carbohydrate having the formula $C_{12}H_{22}O_{11}$, *i.e.*, the condensation product of two monosaccharide molecules .

$$2C_6H_{12}O_6=C_{12}H_{22}O_{11}+H_2O$$

Disc(k) Floret. A regular, tubular flower which is found in the centre of a capitulum when it contains two types of flowers.

Disclimax. Used for describing the final stable state of equilibrium reached by succssion in an area in which it becomes possible to prevent the ultimate growth of trees and shrubs in ultimate climatic climax due to interference in climate by biotic factors (often intensive grazing),

Discontinuous Variation. See *qualitative variation.*

Disease Resistance (resistance). Used for the ability of a plant to resist *i.e.*, remain unaffected by harmful effect of a disease causing pathogen. It may be ***specific i.e.***, effective against a particular strain of pathogen or ***non-specific i.e.***, effective against a variety of strains.

Disjunct Species. A species which occurs in two or more widely separated regions but does not occur anywhere inbetween *e.g.*, magnolias grow in southeast Asia, eastern North America and Central America but nowhere inbetween.

Dissepiment. A separating partition wall in fruits.

Distal. Used for describing the region of an organ which is farthest away from the organ's point of attachment. *Campare* proximal.

Distely. Said of the condition of stele in which vascular system is divided into two separate steles *e.g.*, in certain species of *Selaginella S. kraussiana.*

Distichous. Used for a type of alternate leaf arrangement having successive leaves on opposite side of the stem so that two vertical rows of leaves are seen on the stem which are opposite to each other *e.g.* grasses.

Dithiocarbamate Fungicide. Any fungicide prepared from the organic sulphur compound dithiocarbamic acid *e.g.*, common fungicide ziram, thiram, zineb, maneb, etc.

Diurnal Rhythm. See *circadian rhythm*.

Divergent Evolution (divergence). Describing the evolution of different forms from a single basic structure as a result of different selection pressures acting on it. These changes may be associated with some new function that is added to it or replaces the original basic function. For example phylloclade in plants with reduced leaves take up the function of leaves or short swollen modification of stem to serve as a perennating organ.

Division. The second highest category in the taxonomic hierarchy. Divisions are further composed of classes.

DNA. See *deoxy ribonucleic acid*.

DNA Hybridization. A laboratory technique used for measuring similarity of DNA of two species. In this tachnique DNA of both species, after denaturation by heat into single strands, is mixed together and incubated allowing them to recombine into hybrid DNA molecules (annealing). The amount of annealing is directly proportional to the similarities of DNA strands from two species and is measured by reheating the hybrid DNA and recording the temperature at which strands get separated.

Dolipore Septum. A type of septum occurring in many basidiomycete fungi in which there is a narrow pore surrounded by a thickened rim and protected on both sides by caps.

Dominant. 1. Used for an allele which is expressed in the phenotype and masks the expression of other allele at the same locus. 2. Describing the most abundant plant species in a community. 3. In forestry, describing the tree whose crown of leaves is more than half exposed to full illumination.

Domin Scale. 1. A variation of Braun-Blanquet scale having more subdivisions of the original scale and is more accurate than that.

Dormancy. Used for describing a phase which is exhibited by seeds, spores and buds etc. (perennating organs) during which they remain inactive by deferring growth and development.

Dormin. *See* abscisic acid.

Dorsal. 1. In thallose plants, dorsal represents the upper surface that is away from the substrate. 2. In lateral organs, the dorsal represents the side that is abaxial.

Dorsifixed. Used for an anther which gets joined to the filament for some distance along its dorsal edge, *Compare* basifixed, versatile.

Double Fertilization. Used for the process in angiosperms in which one of the two male gametes entering the embryo sac undergres with the egg nucleus to form the zygote and the other one moving to the centre of embryo sac undergoes fusion either with the polar nucleus or with definitive nucleus to form a triploid primary endosperm nucleus.

A form of double fertilization is also seen in gymnosperms like *Ephedra* in which one male gamete undergoes fusion with the egg cell and the other undergoes fusion with the ventral canal cell but the product of second fertilization does not undergo further development.

Double Flower. A flower having more than usual number of petals. It is usually formed by transformation (by a mutation) of stamens into petals.

Double Helix. A molecule having two similar polymeric chains coiled in the same direction about the same axis e.g., in DNA or actin.

Double Recessive. A diploid individual homozygous for the same recessive allele of a factor which is revealed by the expression of recessive character in the phenotype.

Downy Mildew. A plant disease which is caused by fungi of family Peronosporaceae of order Peronosporales.

DPN. *See* NAD.

Drupe. Used for describing a fleshy indehiscent fruit in which the seed or seeds are surrounded by a hardened sclerenchymatous endocarp, e.g., wild cherry (*Prunus avium*).

Druse (sphaeroraphide). A globular mass of needle-like crystals formed which is either attached to the cell wall or free in the cytoplasm.

Dry Rot. A plant disease with disintegrating tissues and affected cells crumbling into a powdery mass. Dry rot of stored potatoes is caused by fungus *Fusarium solani via. caerulem.*

Duplication. 1. Used for the condition in which two or more copies of same gene are present on a chromosome. 2. Used for the condition in which two or more copies of same segment of chrorosome are present sequentially on a chromosome.

Duramen. *See heartwood.*

Dwarfism. Used for describing stunted growth, which is often caused by some genetic defect, often involving alteration of proportions of various body parts. In plants, it is frequently caused by a gibberellin deficiency.

Dwarf Male (nanandrium). A few-celled, small filamentous structure formed by germination of androspore. It is attached to oogonial wall or the wall of suffultory cell by a hold fast. It occurs in nanandrous species of alga *Oedogonium*.

Dynein. A protein having ATPase activity which makes up the short, paired projections or arms present on the narrower microtubule of each pair of peripheral fibrils in the flagellum.

E

Earth Stars. Used for the fungal members of order Lycoperdales of Gasteromycetes (*e.g., Geastrum triplex*).

Ebracteolate. Lacking bracteoles.

Ecad. A plant form which is adapted to the habitat.

Eccentric, Excentric. (1) Situated to one side.

(2) Having fatty droplets lying to one side of a globular structure.

Ecesis. The invasion of an area by a species which fails to establish itself there, and consequently dies out in a few generations.

Echard. The water present in the soil, which is not available to plants.

Ecocline. A cline that is due to a specific environmental factor *e.g.*, gradual increase in heavy metal tolerance may be correlated with increasing metal concentration in the soil.

Ecological Efficiency. Used for describing the percentage of energy received by a tophic level in unit time that is passed on to the next higher trophic level(s) in unit time *i.e.*

$$\text{Ecological efficiency of trophic level } a = \frac{\text{Amount of energy passed on to next higher trophic level(s) by the trophic level in unit time}}{\text{Amount of energy received by the trophic level in unit time from preceding lower trophic level(s)}}$$

Ecological Factor. Anything in the environment which may be affecting the growth, development and distribution of plants, and hence determines the characteristics of the plant comunity.

Ecological Niche (Niche). Used for the particular place and role of an organism in an ecological community which is determined by its habit, nutritional requirements, competition etc. Niche of a species is defined by tolerance ranges of various factors which are affecting it or by ranges of resources which are utilized by it. Niche breadth may be defined as the sum total of the variety of resources which are exploited by the species. If there is a lack of competition; entire set of resources used in *fundamental niche* which in a real community is always constrained by many competitors and the subset of resources actually available for use by the species is called its *realized niche*.

Ecological Pyramids. Used for describing a graphic representation of some relationship which exists between trophic levels of an ecosystem. Magnitude of characteristic for each level has been represented by the length of a horizontal bar and such bars have been drawn one above the other, starting from producers at the base to top carnivores at the top. Resulting pyramidical diagram is ecological pyramid which shows the relationship between trophic levels with respect to particular characteristic. Generally, pyramids of numbers, biomass and energy transfer have been drawn in the study of ecosystem as a rough representation of numerical, biomass or energy relationship among trophic levels of the ecosystem.

Ecology. The branch of science dealing with the relationship between living organisms and their environment synecology.

Ecophene. Used for the range of phenotypes which are produced by one genotype within a particular habitat. One genotype may be considered to be taken as a mean of a class of closely related genotypes.

Ecospecies. A category of variant individuals capable of genetic recombination with other similar groups, but liable to reduce fitness or fertility from it.

Ecosphere. See *biosphere.*

Ecosystem. The complete ecological system of an area, that includes animals, and the environmental factors.

Ecotone. A boundary between two plant communities of major rank.

Ecrustaceous. Describing a lichen with no well-defined thallus.

Ecotype. Describing a distinct population of organisms within a species that has adapted generally to its local habitat.

Ecotype. See *exocarp.*

Ectogenesis. Variation occurring due to conditions outside the plant.

Ectogenic. (1) Of becteria, living on the outside of a body.

(2) Describing the effect of pollen on the tissues of the female organs of a flowering plant.

Ectoparasite. When referring to a plant, a parasite which feeds from inside the host, but the bulk of the plant-body, and reproductive organs are outside the host.

Ectophlocodal. Living on the outside of bark.

Ectophloic Siphonostele. Used for siphonostele in which ring of phloem is present towards periphery and inner to it, towards centre, is ring of xylem and in the centre is pith.

Ectotrophic Mycorrhiza (ectophytic mycorrhiza). Describing a form of mycorrhizal association having well developed mantle of fungal mycelium on the surface of the root. Fungal members generally belong to Agaricales and such association has been found to be common in trees and often necessary for proper growth of trees.

Edaphic Factors (soil factors). Describing the various physical, chemical and biological properties of soil that influence the living organisms *e.g.*, soil profile, soil texture, soil moisture, soil temperature etc.

Egg. A large, non-motile, uninucleate female gamete for sexual reproduction in organisms.

Egg Apparatus. The functional female nucleus, and the two synergidae in the embryo-sac of an angiosperm.

Ektexine. The outer layer of the exine of a pollen grain. It usually has projections on it.

Ektodynamorphous Soil. A soil whose characteristics are primarily affected by external factors.

Elater. (1) In bryophytes, an elongated, spirally thickened cell which is derived from the sporogenous tissue, and sometime aiding in spore-dispersal.

(2) One of the four strips which is derived from the outer layer of the spore wall of *Equisetum*. It is hygroscopic, but its function is obscure.

Elaterophore. (1) A tissue bearing the elaters.

(2) A central column-like mass of sterile tissue present in the sporangium of the Jungermanniales.

Electron Transport Chain. Used for describing a series of membrane-bound oxidation-reduction reactions in which electrons being transferred from an initial electron doner through a series of intermediate substances to final electron acceptor. Such chains in respiration and photosynthesis form major sources of energy in aerobic living organisms.

Elfin Forest (Krummholz). Used for dwarfed and deformed trees found in the zone between timber line and tree line. These trees tend to grow along the ground that makes them better adapted to strong winds of these regions.

Emarginate. Used for describing a leaf, petal or a sepal having indentations at the tip *e.g.*, notched petals of *Geranium versicolor*.

Emasculation. Describing the removal of anthers of a flower to prevent either self pollination or pollination of surrounding plants.

Embden-Meyerhof-Parnas Sequence. The second phase in glycolysis during aerobic respiration in which a molecule of hexose

diphosphate is broken into two molecules of triose phosphate and two energy-rich phosphates are released. ADP is converted to ATP and NAD is reduced, with the formation of pyruvic acid :—
$C_6H_{12}O_6—(2P)+2NAD+4ADP \rightarrow 2CH_3CO.COOH+2NADH_2+4ATP$.

Embryo. A young plant which is developing from an egg-cell after fertilization, or without fertilization.

Embryo Sac. A large oval cell in the nucellus of the wall of flowering plants within which fertilisation occurs. A typical embryo sac is shown in fig. 9.

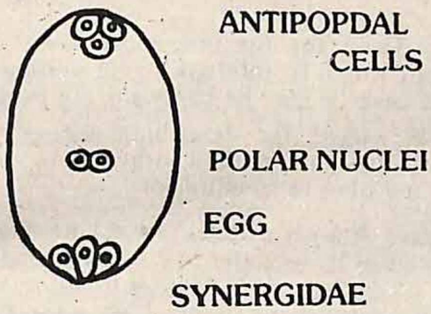


Fig. 9. A typical embryo sac is shown.

Embryo Culture. The growth of isolated plant embryos on suitable culture medium in vitro.

Embryogeny (embryogensis, embryony). Describing the process of formation of embryo from a fertilized egg cell normally.

Embryoids. Used for non-zygotic embryos which are formed in process of development of embryo from diploid somatic cells in suspension cultures as found in some angiosperms.

Embryo Sac. Used for the female gametophyte (megaspore) of angiosperms. It has several nuclei derived from the megaspore nucleus, one of which is the egg-nucleus. Two other nuclei fuse to form the primary endosperm nucleus.

Emerson Effect (Emerson enhancement effect). This effect was observed by Robert Emerson in 1957 that photosynthesis proceeding slowly at illumination of wavelength 700 nm only become greatly increased when illumination of wavelength 700 nm and 650 nm are given together. This elucidates the energy trap in chloroplast absorbing light at 680 nm.

Enation. (1) An outgrowth, usually from a leaf.

(2) Outgrowth from the underside of the veins of a leaf, caused by a virus infection.

Enchylema. The more fluid constituents of the cytoplasm.

Encystment. The formation of a walled, non-motile body from a swimming spore.

Endarch. Describing the direction of differentation of the xylem, when it is cut off from the cambium towards the centre of the axis. The protoxylem then lies on the edge nearest the centre of the axis.

Endemic. Used for a pest, or disease organism which occurs permanently in an area.

Endexine. Used for the inner one of the two layers of exine of pollen which has been recognized on the basis of chemical characteristics.

Endocarp. Used for the inne most layer of the pericarp of angiospermic fruit which is internal to mesocarp and external to seed(s). In some cases it may be stony *e.g.*, in peach.

Endocytosis. Used for describing the entry of particles or fluid into a cell by any method other than diffusion or active uptake through the plasma membrane.

Endodermis. A layer of cells present at the boundary layer of cortex and stele. It is outer to pericycle, and regarded as the innermost layer of cortex. It is distinct in all roots, pteridophytes and in certain dicotyledonous stems. Cells generally have casparian strips. When endodermal cells are having numerous starch grains, it is terned as ***starch sheath***.

Endogamy. (1) In-breeding.

(2) Pollination taking place between two flowers on the same plant.

(3) The union of two sister gametes, both female.

Endogelatin. A gelatinous layer present on the inner wall of the marcosporangia of the Fucales. When wet, it swells, forcing out the macrospores.

Endogenous. Formed inside another organ of the plant.

Endogenous Rhythms. Describing sequential physical or biochemical processes occurring in a plant or its part in response to some stimuli from within *e.g.*, continued periodicity of folding and unfolding of leaflets in certain plants even when kept in continuous darkness.

Endogenous Roots. Used for lateral branches in root system of plants that originate endogenously from the pericycle.

Endogenous Spore. A spore which is formed within a sporangium.

Endogenous Thallus. Used for a lichen thallus, in which the alga predominates.

Endomitosis. The doubling of the chromosomes without the division of the nucleus ; resulting in polyploidy.

Endophytic Mycorrhiza. *See* endotrophic mycorrhiza.

Endoplasmic Reticulum. The submicroscopic, double-layered membranes which are about 100A^0 thick and consist of canaliculi and cisternae. They are much-folded in the cytoplasm, and have microsomal particles usually ribosomes attached to them.

Endopolyploidy. Describing a type of polyploidy where some of the cells of a plant are having more than normal complement of chromosomes for he species.

Endoscopic Embryogeny. Used for the type of embryo sac development seen in Lycopsida, most of Filicinae and all the gymnosperms and angiosperms in which embryo proper is developed from the inner of the two cells that result from first division of zygote. The outer cell often forms the suspensor.

Endosperm. Used for the nutritive tissue which is developed in the embryo-sac of flowering plants, from the fusion of one female nucleus with one or more others, or with a male nucleus, or with both. It forms the food-storage tissue of seed. It is absorbed after germination in endospermous seeds, and before the complete development of the embryo in non-endospermous ones.

Endospore. (1) A small spore which is formed in the cells of some Myxophyceae and bacteria. The spore-wall does not fuse to the wall of the parent cell.

(2) The innermost layer of the wall of a spore.

Endosporic Gametophyte. A gametophyte developing within the spore *e.g.*, female gametophyte of *Selaginella*. Such gametophytes are better able to withstand dryness of environment.

Endothecium. (1) The inner mass of cells in the early development of the sporangium of the Bryophta.

(2) The fibrous layer in the wall of an anther.

Endotoxin. Used for toxic substances occurring within the cells that are formed endogenously in cells of Gram negative bacterial species. These are released into the surroundings after the death of bacterium during the autolysis.

Endotrophic Mycorrhizza. A mycorrhiza in which the fungus is growing almost completely internally, within the cortex of the root.

Endozoic. (1) Living inside an animal.

(2) The method of seed dispersal, in which the seeds are swallowed by an animal, and voided unharmed in the faeces.

Enolase. The enzyme which is catalysing the formation of phosphoenolpyruvic acid from 2-phosphoglyceric acid.

Endophytotic. A plant disease which is causing a constant amount of damage from year to year.

Entire. Used for a leaf, petal or sepal margin which has smooth undivided outline.

Entomophily (insect pollination). Used for the method of pollination in which pollens are carried from anthers to the stigma by insects.

Endostroma. The part of the stroma present within the host plant. It is made up of fungus and host tissue.

Entozoic. Living inside an animal.

Enucleation. The removal of the nucleus of a cell, by manipulation.

Environment. The conditions external, or antecedent to an organism which are related to its development. Its reaction with the genotype decides the phenotype.

Enzyme. An organic catalyst which catalyses a reaction within a cell. All are wholly or partially protein, with or without a prosthetic group. Most of them act highly specific in their effects, *i.e.* one enzyme will effect only one (or a few) reactions. They will function only in a very limited range of pH and temperature, outside which they get destroyed.

Enzyme Technology. Including methods of using isolated and purified enzymes as catalysts in industrial processes. Generally extracellular enzymes are used without requirements of complex cofactors *e.g.*, proteases, amylases, cellulases and lipases extracted from bacterial and yeast cultures.

Eocene. Used for the second period after Palaeocene of Tertiary, between 58 to 22 million years ago. Most of the modern day plants originated during this period, most important were various grasses.

Ephemeral, A plant which completes its life-cycle in a very short time.

Ephemeral Movement. The movement of a part of a plant which cannot be repeated, *e.g.* opening of a bud.

Epiascidium. An abnormal funnel-shaped leaf, having the upper surface of the leaf lining inside of the funnel.

Epibasal Cells. The upper cells of the embryo of the Bryophyta and Pteridophyta, which give rise to the capsule and part of the seta, or to the stem and cotyledon.

Epibasidium. Any structure developing between the hypobasidium and the sterigmata.

Epiblem (rhizodermis). Sometimes used for the outermost layer of cells in roots in place of epidermis.

Epicalyx. Used for the extra whorl of sepal-like floral appendages in some flowers that are lying external to the whorl of sepals (*i.e.*, calyx) *e.g.*, in *Fragaria vesca*. Individual segments are known as *episepals*.

Epicormic. A branch developing from a dormant bud on the trunk of a tree, which only becomes active due to damage to the tree, or some abnormality in the environment.

Epicotyl. The part of a seeding stem which is above the cotyledons, but below the first foliage leaves.

Epictesis. Used for the ability of living cells to accumulate salts in a higher concentration than that in which they are occurring in the surrounding solution.

Epidermis. The outer single layer of cells on an organ. The outer wall may be thickened by the production of a cuticle, and the cells may be extended into hairs.

Epigeal. (1) Living on the surface of the ground.

(2) Used for germinating seeds when the cotyledons are brought above the surface of the ground.

Epigenesis. According to this theory an organism develops from a fertilized egg by involving a gradual series of interdependent physical and physiological changes brought about by genes.

Epigyny. Describing the arrangement of floral parts where whorls of calyx, corolla and androecium are inserted above the level of insertion of ovary forming an inferior ovary *e.g.*, in Rosaceae, Compositae, Cruciferae etc.

Epimatium. A specialized type of ovuliferous scale that bears and completely encloses a single inverted ovule. It occurs in gymnosperm *Araucaria graucana* and in certain Podocarpaceae.

Epimerase. An enzyme catalysing the hydroxyl group transfer from one to another portion within a molecule. It is biologically important in interconversion of sugars.

Epinasty. Used for describing nastic movement which results into downward bending of the involved part of plant du e to increased growth on the opposite, upper side of that part.

Epipetalous. Used for stamens attached to and arise from petals as in many flowers with tubular corolla in Malvaceae.

Epiphyllous. A plant not anchored to the ground but grows above the ground attached to the leaf of some other plant.

Epiphysis. A growth occurring around the hilum of a seed.

Epiphyte. A plant growing on another plant, but not deriving any food from it.

Epiphytotic. An epidemic among plants.

Epiplasm. The residual cytoplasm which is left in an ascus after ascospore formation. Initially it is rich in glycogen, but later it is lost.

Episepalous.. Used for stamens which are inserted on the sepals.

Episome. The plasmid reversibly inserted into the main chromone (bacterial chromosome). Some episomes may be considered as bacterial viruses.

Epistasis. Used for gene interaction in which one gene influences the expression of another gene. It may be easily detected as a modification of Mendelian ratio in F_2 generation. It usually arises because two genes are governing sequential steps in a biochemical pathway thereby leading to the expression of one phenotypic character. It was first reported in inheritance of flower colour.

Epithelium. Used for the lining of a resin canal in gymnosperm or rarely the gum duct of dicotyledonous plant. Its cells are pulled apart during common schizogenous formation of the canal. These epithelial cells usually have a secretory function.

Ergastic Matter. Non-protoplasmic by-products of protoplasmic activity. They include crystals, starch grains, tanins and oil droplets. Many such substances are waste matter but many are storage products.

Ergodic Hypothesis. The succession of vegetation in different places at one time will show the same sequence that one place will show in successive time.

Ergot. (1) A disease of grasses, and cereals which is caused by the fungus *Claviceps purpurea.*

(2) The sclerotium of this fungus, which replaces the seeds of the host, and has alkaloids which cause ergotism in animals and man.

Error Variance. The variance which is arising from agents unrecognized or uncontrolled in an experiment, with which the apparent effect of any recognized agent, controlled, or uncontrolled, is to be compared.

Essential Element. A chemical element, without which a plant cannot develop, and will ultimately die.

Essential Fatty Acid. Used for any of two fatty acids Linoleic acid and Linolenic acid synthesized by plants but not by animals which derive them initially from plant diet.

Essential Oil (ethereal oil). Used for any of the volatile oils of characteristic taste or odour which are produced by some aromatic plants, mostly terpenes while some are derivatives of benzene.

Etaerio. Used for describing any aggregate fruit *e.g.*, etaerio of beries, drupelets, samaras etc. but its use has been sometimes restricted to a fruit which is a collection of drupelets

Etiolation. An abnormal condition which develops in vascular plants in suboptimal light. The leaves are small and yellowed, and the internodes become abnormally long.

Etiology. Science of the study of casual agents of a disease.

Etioplast. A plant plastid which is found in cells of etiolated plant. It is 1.5-2.0 nm in diameter with only partial differentiation inside. A 3-dimensional lattice, prolamellar body, occupies almost whole of the central region. Etioplast has protochlorophyll which gets converted to chlorophyll on exposure to light.

Eucampdromous. Used for the venation in which secondary veins are arising from one primary vein, curving upwards towards leaf, margin and remaining separate *e.g.*, in *Rosa tomentosa*.

Eucaryotic. See *eukaryotic*.

Eucarpic. (1) Having only part of the thallus which is functioning as a fruit-body.

(2) Having both sexual, and asexual reproductive organs separate, and functioning at the same time.

Euchromatin. (1) The lightly staining part of a chromosome which is probably containing most of the hereditary material.

(2) The part of the chromatin which is having its maximum nucleic acid attachment on the mitotic spindle.

Euchromocentre. A part of a chromosome which stains very deeply, but does not loosen out to form part of the reticulum.

Euchromosome. A typical chromosome, in contrast to a sex-chromosome.

Eukaryotic (eucaryotic). Used for describing the cells having nuclear material surrounded by and separated from cytoplasm by a definite nuclear membrane and also membrane bound organelles *e.g.*, plastids, mitochondria, endoplasmic reticulum. Except bacteria and blue-green algae, all cellular organisms possess eukaryotic cells.

Eumitosis. A normal mitosis, in which the chromosomes separate distinctly, and clearly divide longitudinally.

Euphilic. Said of flowers of an insect pollinated species that can be pollinated by a specific insect only.

Euploidy. Used for describing the condition where organism possesses such a number of chromosomes in its nuclei that is an exact multiple of the haploid number.

Eusporangium. Used for the sporangium that is derived from a number of sporangial initials. It is typical of ferns in Marattiales and Ophioglossales.

Eustele. Describing a type of dissected siphonostele (typical of dicotyledons) in which vascular cylinder appears as a ring of collateral (or bicollateral) bundles separated by medullary rays in transverse section.

Eutrophic. Used for the condition of richness of minerals and bases. This term is generally used to describe nutrient-rich lakes and ponds.

Ever-Bearer, Ever-Bloomer. A plant producing leaves and flowers for a long period of the growing season, and often bearing flowers and fruits at the same time.

Evergreen. Used for a woody perennial plant that is bearing and losing leaves continuousoly throughout the year.

Evolution. Used for the gradual change which is taking place in the characteristics of successive generations of a species or race, ultimately giving rise to species or types different from the common ancestor.

Exalbuminous Seed. A seed that lacks endosperm at maturity and in which cotyledons absorb food reserve from endosperm during development and act as storage organs.

Exarch. Used for a xylem strand which has the protoxylem farthest from the centre of the axis.

Exasperate. Having a hard, roughened surface, with short points projecting from it.

Exine. The outer portion of the wall of a pollen grain which is external to intine. It is composed of carotenoid polymer sporopollenin which is highly resistant to decay.

Exocarp (epicarp, ectocarp). Describing the outmost layer of pericarp of an angiospermic fruit which is lying external to mesocarp, usually a thin layer only forming the outermost skin of fruit.

Exodermis. Describing a layer of cells in certain plants, often lying immediately beneath the epidermis or velamen of root. It is essentially a specialized hypodermis.

Exogamy. *See allogamy*

Exogenous. Used for any process or substance having its origin outside the organism or the organ arising from the peripheral layers of the body of the organism.

Exon. Describing a polynucleotide sequence that can code for a specific protein.

Exoscopic Embryogeny. The pattern of embryo development in which embryo proper develops from the outer one of the two cells formed after first division of zygote whereas the inner cell forms the foot. It is observed in Bryophyta, Psilopsida and Sphenopsida.

Exoskeleton. A hard supportive and protective external covering on the body of an organism such as the deposition of calcium carbonate on certain algal members of Charophyta and Rhodophyta.

Exosmosis. Exit of water or solvent by the process of osmosis from a solution which is bounded by a semipermeable membrane to the exterior ; *e.g.*, the loss of water by a living cell due to osmosis.

Exotic. Used for an organism in an area which is not a native of the area but has its origin in some other region. If a plant becomes adapted to its new environment, it is said to be *naturalized.*

Exotoxin. Used for toxic substances which are produced in the cells of many Gram positive bacteria and immediately released through bacterial wall into the surroundings.

Explanation. Used for the removal of parts of the body of a living organism for culture in a suitable artificial medium. Such removed part is called ***explant*** and often consists of only small segment of tissue *e.g.*, leaf discs or meristems. Placements of explants into or onto the culture medium is called *inoculation*.

Exponential Growth. Used for describing growth of a population in which rate of increase of numbers is proportional to the number of members already present. Graph of number of members against time has the shape of exponential curve (*i.e.*, J-shaped).

Extracellular. Describing a process or substance that is located outside the cell.

Extrachromosomal Inheritance. *See cytoplasmic inheritance.*

Extrafloral Nectary. Used for nectary which is situated outside the flower or at any place other than inside of flower *e.g.*, gland spines of certain cacti where they attract seed dispersal agents such as ants.

Extrastellar Cambium. Used for the cambium which is formed outside the stele *i.e.*, not from intra and interfascicular cambia. It may be formed in paricyclic region or in the ground tissue.

Extrorse. Used for anthers that dehisce and release pollens towards periphery of flower *i.e.*, to the outside of flower.

Exudation. The liberation of liquid water, or sap from special pores on the plant.

Eyespot. A light-sensitive organelle found in some of the motile green algae. It consists of a pigment-cup, covered by a light sensitive substance, and sometime with a lens external to this.

F

F. A class of flowers which are pollinated by butterflies and moths.

F_1. The first generation of a cross taking place between two individuals.

F_2. The second filial generation, which is produced by crossing or self-fertilizing individuals of the F_1 generation.

F_1 Hybrid. The variety of a crop which is produced by crossing two selected pure parental lines. F_1 hybrids can have the qualities of both parental lines and usually exhibit hybrid vigour but do not breed true.

Factor. The inherited factor which is responsible for the independent inheritance of a Mendelian difference. *See Gene.*

Factorial Experiment. An experiment in which all the treatments or agents under investigation have been varied simultaneously, and combined in such a way that any derived effect of one or group of them may be isolated, and evaluated separately.

Factor of the Habitat. Anyting in the environment affecting directly or indirectly, the life of a plant.

Facultative. Used for the ability to utilize certain circumchances or environmental conditions but not being dependent on them. For example, a facultative parasite can grow either parasitically or as saprophyte depending on the conditions.

Facultative Anaerobe. A plant respiring both under aerobic and anaerobic conditions.

Facultative Gamete. A zoospore functioning as a gamete.

Facultative Parasite. A saprophyte becoming a parasite under certain conditions.

Facultative Saprophyte. A parasite living as a saprophyte under special conditions.

FAD (flavin adenine dinucleotide). A riboflavin-derived coenzyme which is acting as a prosthetic group to several dehydrogenase enzymes. It accepts electrons and gets reduced to $FADH_2$. Example of FAD-linked enzyme is succinate dehydrogenase. *See also* flavoprotein.

Falcate. Used for describing a thing which is sickle-shaped. This term is usually used for leaves.

Fall. Used for any of the three large, outer, drooping petals of an *Iris* flower. They are bearded in some species (*e.g., I. germanica*).

False Annual Ring. A second ring of xylem which is formed in one season following abnormal defoliation, especially by insects.

False Berry. A fleshy fruit looking like a berry, but that is having some of the flesh derived from the receptacle.

False Dissepiment. A wall which divides the loculus of an ovary into two compartments, but is an ingrowth of the carpel wall, and not a wall between one carpel and the next.

False Fruit. A fruit which is formed from other parts of the flower as well as the gynoecium.

False Hybrid. A plant which is developing after cross-fertilization, but having the characteristic of only one parent.

False Indusium. Used for describing the flap-like covering over the sorus formed by folding of extended margin of 'amina in sporophyll in certain ferns *e.g., Adianatnm.*

False Septum. Used for describing the partition wall that develops later in the middle of an originally unilocular ovary making it bilocular as in family Cruciferae.

Family. Used for the taxonomic division between an order and a genus, but may be a sub-division of a sub-order, or super-family. It possesses similar genera. The names of botanical families usually end in aceae.

Fasciation. Coming together to form a bundle.

Fascicle. (1) A tuft of branches all arising from about the same place.

(2) A tuft of leaves crowded on a short stem.

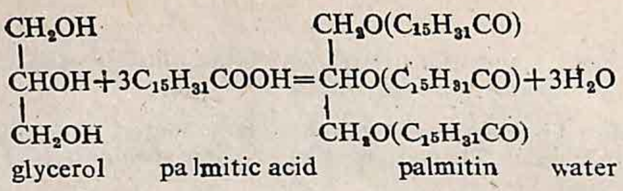
Fascicular Cambium. A flat strand of cambium which is present between the xylem and phloem of a vascular bundle.

Fasciculate. In bundles consisting of members all of the same kind.

Fastigate, Fastigiate. Having many branches which are parallel to the main stem, and usually upright.

Fastigiate Cortex. Of lichens made up of parallel hyphae, at right-angles to the axis of the thallus.

Fat. An ester which is formed by the reaction between a fatty acid and glycerol, *e.g.*



$$\begin{array}{llll} CH_2OH & & CH_2O(C_{15}H_{31}CO) & \\ | & & | & \\ CHOH & +\,3C_{15}H_{31}COOH = & CHO(C_{15}H_{31}CO) & +\,3H_2O \\ | & & | & \\ CH_2OH & & CH_2O(C_{15}H_{31}CO) & \\ \text{glycerol} & \text{palmitic acid} & \text{palmitin} & \text{water} \end{array}$$

Fatty Acid. An acid which forms a fat when it reacts with glycerol. A saturated fatty acids has the basic formula $C_nH_{2n}O_2$, *e.g.* CH_3COOH, while that of unsaturated fatty acid is $C_nH_{2n-x}O_2$ (where x=2, 4, 6, or 8). Those of biological importance usually have an even number of carbon atoms, and are in straight chains,

Fatty Acid Metabolism. Used for describing the breakdown or biosynthesis of fatty acid in living organism. In plants, fatty acids are broken down to yield CO_2, water and energy but in many lipid metabolising tissues, especially germinating oil-rich seeds fatty acids get metabolized to sugars. Major pathway for fatty acid breakdown involves β-oxidation cycle which degrades them to acetyl CoA which in turn can either undergo further oxidation or can be converted to sugar via glyoxylate cycle.

Feedback Inhibition. Describing the type of inhibition of a pathway in which end product of the pathway inhibits the activity of pathway at the starting point. An example is the inhibition of biosynthesis of isoleucine from threonine which is inhibited by isoleucine due to inhibition of first enzyme threonine dehydrogenase in the pathway.

Feedforward Stimulation. A phenomenon in which first substrate of a pathway stimulates the activity of subsequent reactions in the sequence.

Female. Used for describing either the reproductive parts or a whole organism that is bearing the megaspore producing apparatus.

Fen. Used for describing a flat region of land which has developed from open stretches of baserich water that has gradually silted up and region has passed through hydrosere or halosere stage. The area is having a subclimax community because trees can not grow due to persistent wet marshy condition even though there is built up of basic peat. Drained fenlands have been found to be agriculturally very productive.

Fermentation. The enzymatic anaerobic breakdown of a substrate by microorganisms. More specifically it refers to the production of ethanol by yeasts, from monosaccharide sugars.

Ferns. Used for describing members of the class Filicinae of Pteridophyta having about 10,000 species of chiefly tropical herbaceous plants most of which could be distinguished by their characteristics of fronds. All ferns except heterosporous water ferns are homosporous which bear sporangia on the abaxial surface of the lamina in distinct sori.

Feredoxin. Used for describing non-haem iron-sulphur protein. It is an important component of electron transport chain in chloroplasts where it mediates transfer of electrons between photosystem I and the ultimate electron acceptor, NADP via a feredoxin reducing substance and transfers them to NADP through a reaction which is catalysed by feredoxin-NADP reductase.

Fertilization. The fusion of gametes, which results in the formation of a zygote. Strictly it is confined to the fusion of nuclei, but sometimes it refers to condition in which the cells fuse, but not their nuclei, *e.g.* pseudogamy.

Fertilizer. Used for describing any substance that is applied to increase soil fertility and consequent increase in plant growth. It may be organic or inorganic. Three main constituents of fertilizers are nitrate, potash and phosphates; relative amount of these are expressed in N:P:K ratios.

F-Factor. Used for describing episome in cetain bacterial cells which is involved in determining maleness (donor) or femaleness (recepient) nature of bacterial cell in a particular strain.

Fibre. A narrow, elongated, lignified cell which is tapering to a wedge-shape at both ends.

Fibre Tracheid(e). An elongated cell which is found in wood, and has thicker walls and fewer pits than a tracheid, but thinner walls and more pits than a fibre.

Fibrous Cortex. Of lichens, having a cortex which is made up of hyphae lying parallel with the longitudinal axis of the thallus.

Fibrous Layer. A layer of cells which is found in the wall of an anther. The cell-walls get thickened irregularly by bands of material.

Fibrous Root System. Used for describing a mass of fine adventitious roots, of more-or-less equal thickness, and bearing finer lateral roots. They are borne on stems or the hypocotyl, *e.g* grasses.

Fibro-Vascular Bundle. A vascular bundle of sclerenchyma, which is usually present on its outer side.

Field Capacity. The amount of water which is held in the microspaces of soil after excess gravitational water has run off due to percolation.

Filament. (1) A chain of cells, set end-to-end.

(2) The stalk of a stamen.

(3) In the Cyanophyta, a trichome(s) and its enclosing sheath.

Filamentous. Thread-like.

Filamentous Iron Bacteria. The colourless rod-shaped gram negative bacteria of order Chlamydobacteriales that aggregate into filaments which sometimes get branched.

Filamentous Sulphur Bacteria. The filamentous bacteria of order Beggiatoales that move by gliding over the substratum. They grow by oxidizing sulphides.

Filiform. Used for a structure that has thread-like form.

Fimbria. *See* pilus.

Finger-and-Toe Disease. *See* club root.

Fire Blight. Used for describing a seriously damaging disease of pears and other members of Rosaceae caused by bacterium *Erwinia amylovora.* It attacks blossoms and leaves in spring and with advancement of disease, branches and whole tree appears as if they are scorched by fire.

Fission. Used for a method of asexual reproduction which involves splitting of nucleus and cytoplasm usually into two equal parts thereby forming new individuals genetically identical to the parent.

Fission Fungi. Used for describing the members of class Schizomycetes of fungi in older classifications which included bacteria also. Now the name is not used because bacteria are distinctly different from fnngi.

Fission Yeasts. Used for describing yeasts of genus *Schizosaccharomyces* that reproduce asexually by budding or fission into two equal parts and sexually by ascus formation.

Fitness. Used for expressing relative ability of an organism to produce large numbers of viable offspring that survive to reproduce and therefore themselves contribute to the gene pool of the next generation.

Fixation. The treatment of a specimen with a reagent for fixing its structure and appearance in a life-like condition.

Fixation of Nitrogen. The formation of nitrogenous compoynds from gaseous nitrogen, by soil bacteria.

Fixative. A reagent which will bring about fixation.

Flaccid. A wilted condition of a tissue or organ which results from deprivation of water when cells lose their turgour and tissue or organ loses its rigidity.

Flagellin. A type of protein resembling the protein myosin of contractile vacuole fibres and forming three intertwined strands of flagellum of prokaryotic cells.

Flagellum. A whip-like locomotory organ. Typically it consists of an axoneme and a sheath. The axoneme consists of nine long fibres surrounding two central ones. The sheath has an outside membrane.

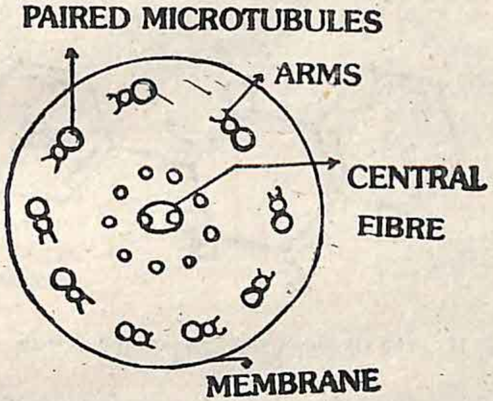
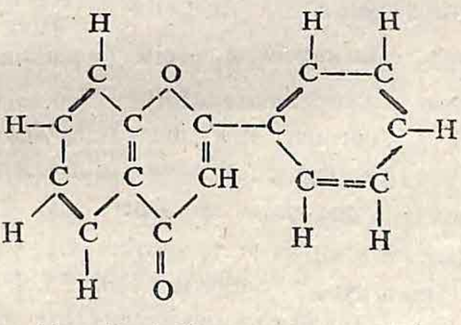


Fig. 10 Cross section of an eukaryotic flagellum.

Flavanones. Used for describing a group of flavonoid compounds in which there is no double bond between carbon two and three of C_3 group in the centre of flavonoid nucleus. Example is narigenin which causes bitterness of lemons.

Flavin. Used for describing any of a group of yellow pigments having absorption spectrum peak around 370 nm. They are active in certain plant growth responses to light.

Flavones. Used for describing a group of flavonoid pigments in which there is an unaltered flavonoid nucleus. They include flavone found in certain *Primula* species and more widespread apigenin and luteolin.



Flavonoids. Desbribing a group of plant compounds having a 2-Phenylbenzopyran nucleus. They include flavones, anthocyanins, flavonones, chalcones aurones and flavonols. These are usually found in combination with sugars as glycosides. They have been isolated from bryophytes and vascular plants but not from algae, fungi or bacteria.

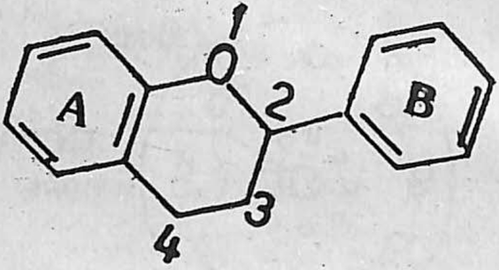


Fig. 11 The flavonoid nucleus (2-phenylbenzopyran).

Flavonols. Used for describing a group of flavonoid compounds which have hydroxyl group on the third carbon of C_3 group in the centre of flavonoid nucleus.

Flavo-Proteins. Conjugated proteins in which the prosthetic group is riboflavin-phosphoric acid, or a compound of this with another nucleotide. They function as hydrogen-carriers in oxidations.

Flimmer Flagellum. *See* pantonematic.

Flocculation. Process that is involved in formation of soil crumbs by the liming of heavy clay making them more workable.

Floral Diagram. A composite diagram of a transverse section through a flower to show the position of the various parts, and their relation with other parts.

Floral Envelope. The calyx and corolla, or perianth.

Floral Formula. A summary of the characteristics of a flower. K=calyx, C=corolla, A=Androecium (stamens), G= gynoecium (carpels). The number following represents the number of parts. ( ) means that the parts are fused, *e.g.* C(5) means 5 fused petals. $\frown$ indicates 1 whorl fused to another, *e.g.* $C\overset{\frown}{(5)}A$ would mean a corolla of 5 fused parts to which are joined 5 free stamens. A line below the figure for the gynoecium, means that it is superior, *e.g.* G5, beside it, *that it is* perigynous, *e.g.* G(5)-, and above it inferior, *e.g.* G(3).

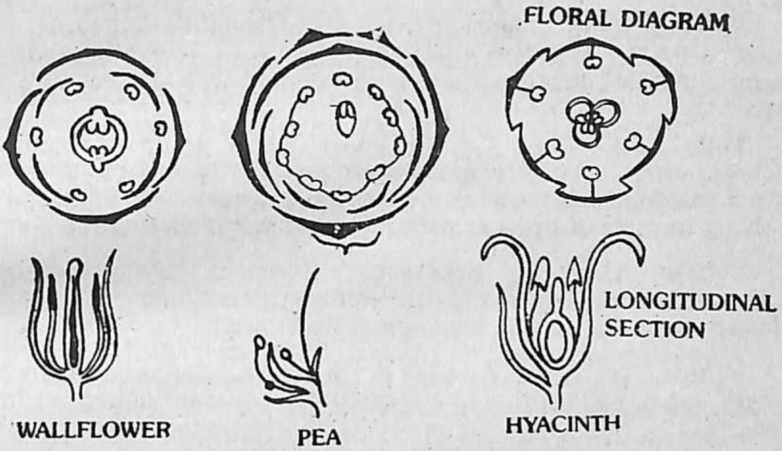


Fig. 12 Floral diagram.

Floral Leaf. (1) A bract or bracteole.
(2) A petal or sepal.

Flore Pleno. Used for a double flower in which carpels have also become modified into petals *e.g.*, in *Ranunculus aconitifolius* 'flore pleno'.

Floret. A small flower *e.g.*, disc or ray floret which makes up the captitulum inflorescence of family Compositae. In grasses, lemma, palea and the flower within them comprise a floret.

Foridean Starch. A type of starch which in algal plants of Rhodophyta is the main storage product. Its structure is similar to amylopectin.

Floristics. Dealing with the study which is involving taxonomic identification and the listing of all the plant species present in a community and the list so prepared gives the *floristic composition* of the community.

Flower. Used for the reproductive stem of the angiosperms. Typically it is composed of of a calyx of sepals, a corolla of petals, (these two being the perianth), an androecium of stamens, and a gynoecium of carpels. Any of these parts may not be present in a particular flower. The floral axis is the receptacle.

Fluid-Mosaic Model. According to this model, the structure of plasma membrane is like a fluid in which both phospholipid and proteins constituting the membrane are capable of lateral movement within the membrane.

Flushing. Used for a process by which soluble substances in the lower layers of the soil come upwards and get deposited at or near the soil surface. It occurs, for example, in water medows, fenlands and in area having springs.

FMN (flavin mononucleotide). A riboflavin-derived coenzyme similar to FAD. It acts as a prosthetic group to several dehydrogenases. NADH dehydrogenase is an example of FMN-containing enzyme.

Folic Acid. Used for a member of B group of vitamins which were first isolated from spinach leaves. Its activated form (tetra hydrofolic acid), acts as a coenzyme in reactions which are involving transfer of hydroxymethyl, formyl and methyl groups.

Foliose. Used for organisms which are having leaf-like shape. This term is generally used to describe leaf-like plant body of lower plants *e.g.* certain lichens and liverworts.

Follice. (1) A many-seeded dry fruit which is derived from a single carpel, and splitted longitudinally down one side at dehiscence.

(2) A small bladder present on the leaves of some mosses.

Food Body. A mass of cells present on the outside of a seed-coat, attracting ants which help in dispersal. The attraction is due to stored food, usually oils.

Food Chain. Describing the linear sequence of organisms which represent their prey-predator relationships in the ecosystem. Chain usually starts from a producer (*autotrophic chain*) and rarely has more than five steps in the series. Each *organism at each step of chain is corresponding to one* trophic level. *Example of food chain is as follows :*

Festuca ovina (grass)←— *Microtus agrestis* (vole)←—
Mustela (weasel).

or

Chaetoceros←—*Calamus*←—*Ammodytes*←—*Clupea*←—
Phalacrocorax←—*Navicula*←—*Temora*←—|

Food Web. Used for a network which is representing all the feeding relationships of organisms in an ecosystem. It comprises of branched and inter-linked food chains.

Foot. Describing the basal portion of an embryo, sporophyte or spore producing body which is embedded in the parental tissue. It serves to anchor and absorbs nutrition from the parent.

Foot Rot. A plant disease which is characterized by rotting of root system and lower portion of the stem. Example is foot rot of tomato which is caused by *Phytohpthora cryptagea*.

Forest. A major type of biotic community which is characterized by dominance of trees. Three major types of forests have been recognized on the basis of climatic regions; cold forests temperate forests and tropical forests.

Form Genus, Form Species. A group of species having similar morphological characters, but are not known certainly to be related by descent. The species form species.

Formic Dehydrogenase. An enzyme breaking down formic acid to carbon dioxide and water in the presence of co-enzyme I.

Formic Hydrogenlyase. An enzyme in a few groups of bacteria catalysing the combination of carbon dioxide and hydrogen, or bicarbonate ions and hydrogen to form formates.

$$CO_2+H_2 \rightarrow H^+ + HCO_2^-$$
$$HCO_3^- + H_2 \rightarrow HCOO^- + H_2O$$

Fossils. A term used for the remains of organisms from past geological ages which were preserved mostly in sedementary rocks as actual structures or as impressions, casts or moulds of structures which are no more living. Processes of fossil formation are carbonization, petrification etc. Remains of macroscopic parts *e.g.*, branches, petioles, leaves, fruits and seeds are known as *megafossils* and those of microscopic structures *e.g.*, pollens and spores are known as *microfossils*.

Founder Principle According to this, a small pioneer community established in genetic isolation from the parent population will possess a small and possibly non-random selection of genes from the parental gene pool. Consequently, the community that is developing may take a different evolutionary course from that of the parent community.

Fraction I Protein. Used for soluble stroma protion of chloroplasts which accounts for 50 per sent of the soluble stroma protein content. It consists of enzyme ribulose biphosphate carboxylase (RuBP). Its particles are almost isodiametric, between 10-12 nm in diameter and each is made up of twenty to thirty identical, smaller particles which are arranged in a cubic or octahedral 3-dimensional array.

Fragmentation. A type of asexual reproduction in which body of a parent plant breaks up into smaller pieces, each of which is develobed into a new plant.

Free Central Placentation. A type of placentation in angiosperms in which ovary is multicarpellary, syncarpous and unilocular and placentae develop on a central dome or column of tissue that arises from the base of the ovary. This form of placentation is found in Primulaceae and Caryophyllaceae.

Free Space. The part of protoplasm in a cell in which relatively free exchange of inorganic ions between protoplasm and extracellular fluid can take place. It consists of the region lying between outer membrane of protoplasm and the tonoplast. Ions can enter cell vacuole by active absorption but due to relative impermeability of tonoplast membrane, cannot pass out again.

Frond. Used for describing a large leaf or leaf-like structure. This term is most frequently used for the dissected leaves of ferns, cycads and palms.

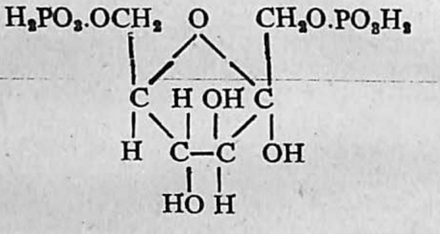
Frost Resistance. Used for the ability of many arctic and temperate plants to withstand subzero temperatures.

Fructification. Any strcture bearing seeds, spores especially one which is easily visible e.g., aerial fruiting bodies of many higher fungi.

Fructosans. Used for polymers of ketosugar fructose, most important of which is inulin.

Fructose : (fruit sugar, laevulose). A ketohexose sugar. In solution, it forms a ring to give fructofuranose. It is commonest keto sugar and component of disaccharide sucrose and also occurs freely as monosaccharide in plant tissue e.g., fruit juices.

Fructose 1:6 Biphosphate. A biphosphate of fructofuranose which is ultimately changed to two molecules of pyruvic acid during respiration.



Fruit : 1. Any of the fleshy structures associated with a gymnospermous seed like succulent aril of *Taxus baccata* or fleshy ovuliferous scales of some members of Podocarpaceae as in *Juniperus*. 2. The structure which is developing from ovary wall and enclosing the maturing seeds in angiosperms. A fruit has been classified as *dry* or *succulent* on the basis of dry or fleshy mesocarp and as dehiscent or indehiscent on the basis of whether it splits or not to release the seed(s). Fruit developing from gynoecium of a single flower is termed as *simple* or *true fruit* but if it is developing from an inflorescence, it is termed as multiple fruit. Aggregate fruits are developed from apocarpous polycarpellary ovary. A fruit may have tissue other that of gynoecium i.e., the *pseudocarpic fruit* or sometimes may develop without fertilization and seed formation, i.e., *parthenocarpic fruit*. See Fig. 13.

Fruit-Body. A well-defined group of fungal spores and the hyphae which bear, and surround them.

Fruit Drop. Used for premature abscission of a fruit even before it is complete ripened. It is a normal process and in many plants peak period of fruit drop can be identified e.g. drop of apple fruits just after pollination (post blossom drop), during rapid

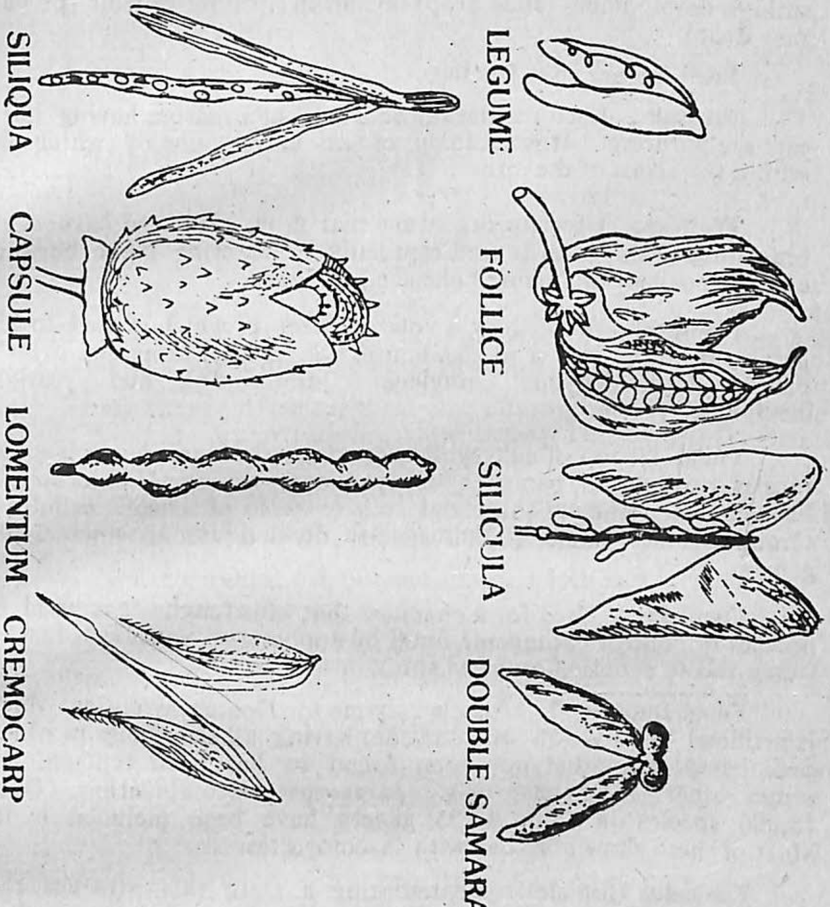


Fig. 13 Different types of fruits.

embryo development (June drop) or during ripening of fruit (preharvest drop).

Fruit Sugar. See fructose.

Frustule. Used for the siliceous wall of a diatom having intricate sculputuring. It is made up of two halves, one of which fits within the edges of the other.

Fruticose. Used for organisms that grow erect and have much branching. This term is used especially to describe plant body of erect or pendent branching lichens e.g., *Usnea.*

Fumigant. Describing a volatile chemical which is used to kill pathogens in the soil or in glasshouses e,g., methyl bromide, chloropicrin, formaldehyde, ethylene dibromide and carbon disulphide.

Fungi. Group of eukaryotic organisms that are heterotrophic, mostly saprophytes, parasites or symbionts having no chlorophyll, have characteristically chitinized walls or walls of fungal cellulose. Group includes some 50,000 species divided among some 5,100 genera.

Fungicide. Used for a chemical that kills fungi. It is used to prevent or control pathogenic fungi by applying to seeds as dust or slurry and to standing crops as spray or also to soil.

Fungi Imperfecti. Another name for Deuteromycotina which is artificial subdivision of Eumycota having all the fungi in which sexual stage has either not been found or has been replaced by some other mechanism *e.g.*, parasexual recombination. Over 15,000 species in some 1,825 genera have been included in it. Most of these show affinities with Ascomycetes.

Funiculus (funicle). Representing a stalk that attaches the ovule to the placenta of ovary wall in angiosperms. It later attaches seed to the placenta.

Furanose Ring. Used for a ring having four carbon and oxygen atoms. It is formed by ketose sugars with five or more carbon atoms. Such rings are also formed by aldose sugars.

Fusiform. Used for a structure that has elongated shape that tapers at both ends.

Fusiform Initials. Used for more or less elongate initials in vascular cambium which give rise to components of axial (longitudinal) system of secondary xylem and secondary phloem *e.g.*, vessel elements, tracheids, sieve tube elements. They also give rise to ray initials.

G

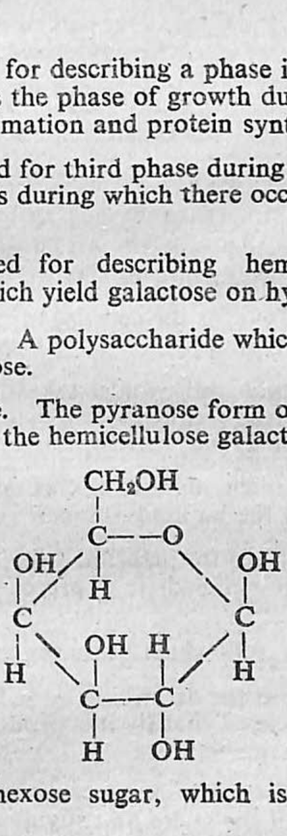
G_1 Phase. Used for describing a phase in cell cycle which starts after cytokinesis. It is the phase of growth during which there occurs high rate of RNA formation and protein synthesis.

G_2 Phase. Used for third phase during cell cycle before prophase in mitosis starts during which there occurs growth in the cell for a short duration.

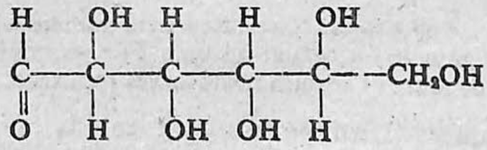
Galactans. Used for describing hemicelluloses, mucilages, pectins and gums, which yield galactose on hydrolysis.

Galactoaraban. A polysaccharide which is a polymer having galactose and arabinose.

Galactopyranose. The pyranose form of galactose, which on polymerisation forms the hemicellulose galactan.



Galactose. A hexose sugar, which is commonly found in plants.

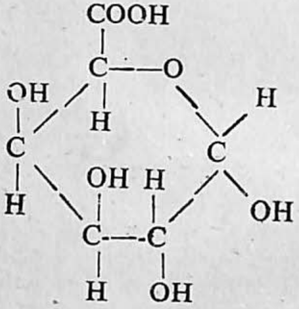


$$\begin{array}{cccccc} \mathrm{H} & \mathrm{OH} & \mathrm{H} & \mathrm{H} & \mathrm{OH} & \\ | & | & | & | & | & \\ \mathrm{C}- & \mathrm{C}- & \mathrm{C}- & \mathrm{C}- & \mathrm{C}- & \mathrm{CH_2OH} \\ \| & | & | & | & | & \\ \mathrm{O} & \mathrm{H} & \mathrm{OH} & \mathrm{OH} & \mathrm{H} & \end{array}$$

d-Galactose

Galactosidase. An enzyme calalysing the hydrolysis of galactosides.

Galacturonic Acid. Used for the acid formed from galactose. These units are condensed to form pectic acid, which reacts with calcium or magnesium to form insoluble pectates.



α-D-Galacturonic acid

Gall. An abnormal growth which is caused by the attack of a pest or disease organism.

Gametangiophore. An upright structure that bears female gametangia or male gametangia in certain liverworts.

Gametangium. Used for the cell organ in which gametes are formed. Especially of thallophyta. They may fuse directly.

Gamete. A haploid cell which takes part in sexual fusion. The two gamete nuclei, and frequently the cytoplasm, fuse to form a diploid zygote. Gametes may develop directly without fusion.

Gametic Number. The number of chromosomes present in a gamete nucleus, usually the haploid number.

Gametogenesis. Used for describing the formation of gametes, including meiosis, if it immediately precedes the formation of gametes.

Gametophore. A stalk which bears sex-organs.

Gametophyte. Used for describing an individual of the haploid generation in the life-cycle. Typically it is produced from a haploid spore, and produces the gametes.

Gamogastrous. Used for a syncarpous gynoecium in which the ovaries are fused, but the styles and stigmas are free.

Gamone. Any substance released by a gamete which serves to attract another gamete for sexual fusion. For example, malic acid released by archegonia of certain ferns serves to attract male gametes.

Gamopetalous. Used for describing corolla in a a flower in which petals get fused along their margins upto the base to form a corolla tube.

Gamosepalous. Used for describing calyx in a flower in which sepals are fused along their margins to the base to form a tube-like calyx.

Garigue (garrigue). A type of scrub woodland characterically on limestone areas which have thin, poor, dry soil and low rainfall. Vegetation is low growing and consists of aromatic, often spiny, species *e.g.*, *Salvia officinalis*, *Thymus*, *Lavandula vera* etc.

Gaseous Exchange. The diffusion of gases in and out through a cell wall.

Gas Vacoule. Used for describing a large cavity in the cells of the Cyanophyta. They may have gas or a viscous substance, and may help to increase buoyancy.

Gegenpol. Use for the pole of a resting nucleus, which lies farthest from the centrosome.

Gelatinous Fungi (Jelly fungi). Used for describing fungal members of order Tremellales of Hymenomycetes that produce gelatinous basidiospores. They include about 200 species of 26 genera. They are found usually on dead wood.

Gemma. A cell, or group of cells which is involved in asexual reproduction. Found in some aglae, fungi and bryophytes.

Gemma Cup. A cup-or crescent-shaped outgrowth from the gametophyte of some liverworts. It contains the gemmae.

Gene. One of the units of inherited material which is carried on a chromosome. They are arranged in a linear fashion, and are indivisible, but capable of self-replication. Each represents a unit character, which has been recoganized by its effect on the individual bearing the gene in its cells. There are 1000 genes in each nucleus.

Gene Bank. An institution in which plant material which is in danger of becoming extinct in wild conditions or being lost from cultivation, has been stored in a viable condition, normally as reproductive propagating organs.

Gene Centre. (centre of diversity). The area showing considerable genetic diversity of certain crop plants and their relatives. Certain such centres (primary centres) are regarded to be the regions of origin of particular crops *e.g.*, Middle East for wheat.

Genecology. Dealing with the variation in gene frequency within a species in relation to environmental change.

Gene Flow. Describing the movement of genes between populations of the same species due to interbreeding.

Gene Frequency. Used for proportion of an allele in the population compared with that of other alleles of that gene. Suppose a gene A has alleles A and a and frequency of $a=0.2$ (20%) then that of allele $A=0.8$ (80%) since $a+A=1$ (100%).

Gene Mutation. Used for describing any alteration in a single gene which involves a change in the number, type or sequence of bases in a polypeptide due to some external or internal agent.

Gene Pool. Said of the sum total of all the variety of genes and their alleles present in a breeding population or species at a time.

Generation Time. The time taken by a unicellular organism between one cell-division and the next.

Generative Cell. A cell in the pollen grain of the gymnosperms which gets divided to give a stalk cell and a body cell.

Generative Nuclei. In angiosperms, the two male gametes are formed by division of generative cell. Then, they migrate down the pollen tube behind the vegetative nucleus and are released into the embryo sac by dissolution of the tip of pollen tube and then one of them undergoes fusion with egg cell to form zygote and other one undergoes fusion with polar nuclei to form primary endosperm nucleus.

Genetic Code. Used for describing the sequence of nucleotides in the polypeptide of DNA in an organism which is having the information to code for a molecule of protein.

Genetic Drift (Sewall Wright effect). A change in the frequency of gene which has taken place due to pure chance instead of any natural selection. It occurs in small populations.

Genetic Engineering (recombinant DNA technology). Dealing with the isolation of useful gene(s) from a particular donor organism or its tissue and the incorporation of this gene into other organism that normally does not have the gene.

Genetic Erosion. Describing the loss of genetic variation and consequent narrowing of genetic base of cultivated plants due to large scale introduction and cultivation of suitable varieties that will replace the locally adapted primitive varieties.

Genetic Load. The proportion of disadvantageous genes which are present and maintained in the population. It has three components : *mutational load*, *segregation load* and *substitutional load*

Genetic Resources. Used for describing diversity and availability of alleles in both natural and artificially maintained stocks of organisms.

Genetics. The science of heredity, which deals with the study of its chemical fundation, its developmental expression and its bearings on variation, selection adaptation, evolution, breeding and the activities of man.

Genetic Spiral. A hypothetical line drawn on a stem which is passing by the shortest path through the points of insertion of successive leaves.

Genome. A complete set of haploid number of chromosomses present in an organism. A diploid has 2 genomes usually if it is not an interspecific hybrid where it has two different genomes. Number of chromosome in a genome is represented by the symbol x. In diploid, 2x=2n but in tetraploid,2n=4x or in hexaploid, 2n=6x.

Genotype. Used for describing the genetic constitution of an organism which is opposed to its phenotype.

Genus. A taxonomic rank having related species. Similar genera are collected int o a family.

Geological Time Scale. The scale which is representing periods of past time on the basis of geological evidence obtained from study of rock strata where they get exposed due to natural causes or by human activity.

Geophyte. A plant which perennates by subterranean buds.

Geoplagiotropic. Growing in a direction at an angle to the ground surface.

Geotaxis. Said of the movement of an entire plant in response to gravity.

Geotome. An instrument for taking soil-samples, without disturbing the surrounding soil.

Geotropism. Said of the growth of part of a plant due to the influence of gravity.

Germination. The intake of water by a seed, spore etc. leading to an increase in metabolism and elongation, finally resulting in the formation of new tissue.

Germ Plasm. Said of the genetic material, especially that contained within the reproductive (germ) cells in an organism.

Germ Pore. A thin-walled area on a spore-wall, or pollen grain through which a germ-tube is produced.

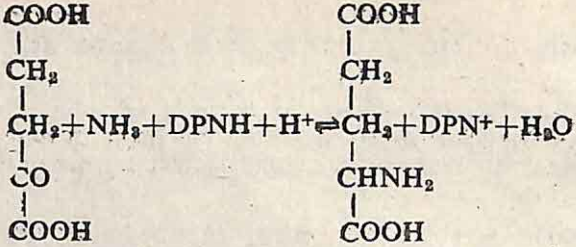
Germ Sporangium. A sporangium which is formed at the end of a germ-tube produced by a zygospore.

Germ Tube. (1) A tubular outgrowth, put out by a germinating spore, from which the thallus is developed by branching, or a germ sporangium is produced.

(2) A tube put out by a germinating pollen grain, carrying the male nuclei, and growing down throught the style.

Giant Ferns. Used for the members of order Marattiales of pteridophytes of Filicinae numbering about 100 species of 6 genera. They are large, fleshly tropical ferns. In most species, plant is a sporophyte and has a broad and short stem on which arise large, compound fronds having sporangia formed on abaxial surface of sporophylls that otherwise resemble normal sterile fronds.

Gibberellic Acid (GA_3). The first of the plant growth substances gibberellins which was isolated from fungus *Gibherella fujikuroi* by Kurosawa that causes a disease of rice seedlings characterized by



$$\begin{array}{l} \text{COOH} \\ | \\ \text{CH}_2 \\ | \\ \text{CH}_2 + \text{NH}_3 + \text{DPNH} + \text{H}^+ \rightleftharpoons \\ | \\ \text{CO} \\ | \\ \text{COOH} \end{array} \begin{array}{l} \text{COOH} \\ | \\ \text{CH}_2 \\ | \\ \text{CH}_2 + \text{DPN}^+ + \text{H}_2\text{O} \\ | \\ \text{CHNH}_2 \\ | \\ \text{COOH} \end{array}$$

α-ketoglutaric acid glutamic acid

Glutamine Synthetase. The enzyme catalysing the synthesis of glutamine from glutamic acid and ammonia.

Glutelins. A group of simple protiens that are insoluble in water, dilute salt solutions, 70% ethanol, but dissolve in dilute alkalis or acids.

Gluten. (1) A reserve protein which is found in plants.

(2) The sticky coating on the pilei of some agarics.

Glycogen. A storage polysaccharide, branched glucan, like amylopectin but with more frequent branching occurring every 8-12 glucose residues. It is similar to starch in structure. It is not found in plants except in certain bacteria, blue-green alage and fungi.

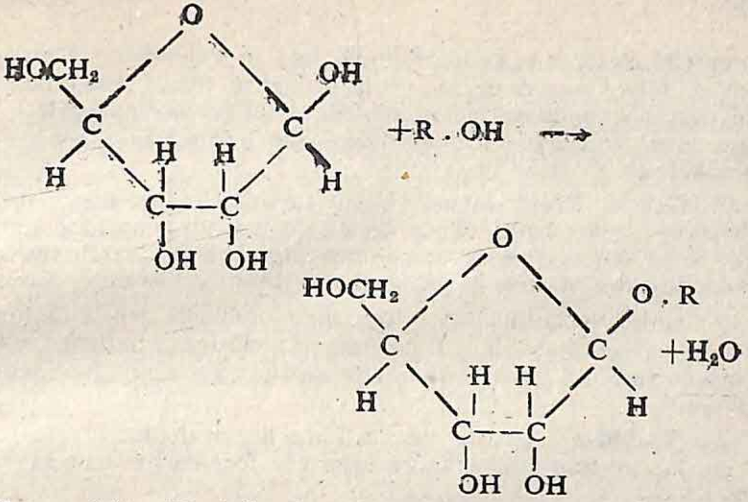
Glycolic Acid. A substrate which gets oxidized during photorespiration in C_3 plants. It is formed by oxidation of ribulose biphosphate to phosphoglyceric acid and phosphoglycolic acid and hydrolysis of phosphoglycolic acid then yields glycolic acid. It gets oxidized by molecular oxygen during photorespiration, catalyzed by glycolate oxidase to yield glyoxylic acid. This reaction takes place in peroxisomes and also produces H_2O_2.

Glycolipid (glycosyldiacylglycerol). Used for describing any of a group of acylglycerols having a carbohydrate group, usually a mono di-or trisaccharide or an amino sugar. These are major lipid constituents of chloroplasts.

Glycolysis (Embden-Meyerhof-Parnas pathway). Used for describing pathway in which glucose breaks down to pyruvic acid anaerobically. Glycolysis of one glucose molecule consumes 2 ATP and yields 4 ATP molecules.

Glycophytes. Used for describing plants that are sensitive to a high salt-concentration in the soil.

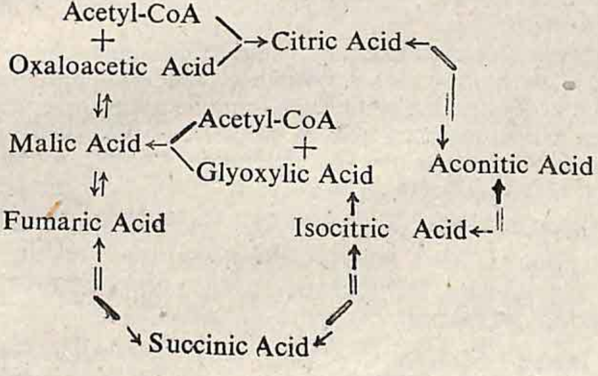
Glycoside. A compound which is formed by the combination of another molecule (ROH) with the H^+ of an OH radicle of a sugar.



Glycoprotein. Used for describing a macromolecule consisting of a backbone of protein along which short disaccharide branches are attached at invervals.

Glyoxylate cycle (glyoxalate cycle). Used for describing a cyclic metabolic path way involving TCA cycle intermediaries in which one molecule of succinic acid is formed by the combination of two molecules of accetyl CoA. Reactions differing from TCA cycle get catalyzed by isocitric lyase and malate synthetase respectively. No CO_2 gets formed in the cycle and cycle allows formation of carbohydrate from fatty acides via succinate. Enzymes of the cycle are active in oil bearing seeds and in other fat metabolising tissues present in the plant. This cycle can take place in micro-organisms but not in animals.

Glyoxylic Acid Cycle. A modification of the Citric Acid Cycle. It seems to be limited to tissues where fats are being rapidly consumed, *e.g.*, the endosperm of germinating fatty seeds.



excessive elongation of shoots and leaves. Its basic structure, like other gibberellins, is having gibbane carbon skeleton. It is a terpenoid and is synthesized from mevalonic acid.

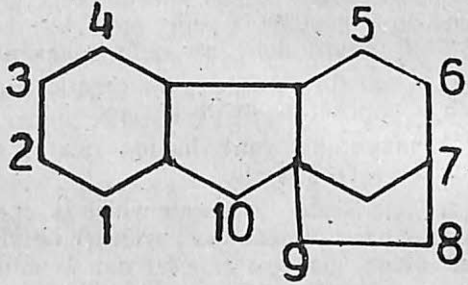


Fig. 14. The gibbane skelton.

Gibberellins. A group of growth-promoting substances which occurred widely in plants. They increase rate of photosynthesis, *e.g.* increase cell-elongation, promote germinantion and flowering.

Gibbose, Gibbous. (1) Swollen, especially at one side.

(2) Pouched.

(3) Convex above, and flattened below.

Gill. One of the vertical plates of mycelium which bear the hymenium of an agaric.

Girdling. Said of the condition when a leaf trace arises on the opposite side of the stele from the leaf which it serves, and in reaching the leaf curves widely through the cortex.

Glabrous. A surface that is smooth, but lacks hairs or any type of projections.

Gland. An organ, or cell which is secreting a specific substances, sometimes surrounding a cavity.

Glans. A hard, dry, indehiscent fruit, having one or more seeds. It is derived from an inferior ovary, and more or less enclosed in a cupule.

Glaucous. Used for describing a surface having a waxy, greyish blue-green bloom *e.g.*, the leaves of rape or swede.

Gleba. The mass of spore-producing tissue which forms in the fruiting bodies of such fungi as truffles, puffballs, earthstars, stickhorns etc. It is enclosed by the peridium.

Gley Horizon. A horizon in a soil which is characterized by the deposition of secondary hydrated ferric oxide.

Gley Soil. A soil developed under impeded drainage, and. in consequence, is having a horizon of secondary hydrated ferric oxide. More generally, with a greenish-grey shiny horizon, which may have little iron.

Gliadin. A storage protein, found particularly in wheat grains.

Gliding Bacteria. Used for bacteria of order Beggiatoales. They are unicellular or filamentous and move by gliding over the surface. Many are filamentous sulphur bacteria growing by oxidizing sulphides.

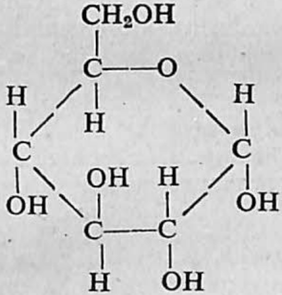
Glochid. A short hair, many of which are arising in tufts from the areoles of some cacti. It is a type of glochidium.

Glochidium. Hair-like processes on the masses of microsporangia produced by *Azolla*. They serve for attachment to the macrosporangium.

Glucan. Any polysaccharide which is made up exclusively of glucose subunits *e.g.*, starch and cellulose.

Gluconeogenesis. Used for the reactions of formation of glucose from various precursors *e.g.*, pyruvates: certain amino acids and intermediates of Krebs' cycle. Most of the stages have been found to be reverse of glycolytic reactions except conversion of phosphoenol pyruvate to pyruvate and conversion of Fructose 1, 6-biphosphate to fructose 6-phosphate.

Glucose (dextrose, grape sugar). An aldolase sugar forming a 6- membered pyranose ring in solution. It is main fuel for respiration and basic substrate forming cellulose, starch and other carbohydrates. It is synthesized by photosynthsis in plants but also by other pathways.



Glucoside. A glycoside in which the sugar is glucose, and which is formed from it on hydrolysis.

Glucuronic Acid. The type of uronic acid which is derived from glucose. It is a common constitiuent of gums and mucilages.

Glume. One of a pair of dry bracts, at the base of and enclosing the spikelet of grasses.

Glutamic Acid Dehydrogenase. The enzyme catalysing the reversible reaction of α-ketoglutaric acid to glutamic acid.

Glyoxysome. A microbody having 5 enzymes of glyoxylate cycle. Glyoxysomes occur in cells of higher plants that utilize fat in this way *e g*. endosperm or cotyledons of fat storing seeds. These also have an enzyme for catalyzing the decomposition of hydrogen peroxide to water and oxygen.

Golden Brown Algae. Used for discribing the members of division Chrysophyta. They usually consist of flagellate, uniceillar but some colonial and filamentous algae which usually have two golden-brown plastids in each cell and store food as fat or leucosin.

Golgi Apparatus. A cytoplasmic organelle which is found in all cells except bacteria. It consists of a cluster of flattened, parallel, smooth-surfaced sacs, and many smaller vesicles. Its function is obscure.

Gonidium. 1. An algal cell in a lichen thallus.

2. A non-motile spore which is formed by some Myxophyceae.

3. A gemma of some liverworts.

Gradate Sorus. A fern sorus, in which the sporangia gets developed from the apex of the receptacle downwards.

Gradient. The condition when the intensity of a stimulus acting on a plant increases or decreases towards the plant.

Graft. A small piece of meristematic tissue, *e.g*. a bud or growing shoot, called the scion, is made to unite with a larger established plant, called the stock.

Graft Hybrid. A chimaera which is produced by grafting dissimilar plants.

Grain. See caryopsis.

Gram Negative Bacteria. Said of bacteria that lose violet colour on staining with a basic dye such as gentician violet and mordant when they are subsequently made to treat with a decolouring agent (*e.g*., acetone) and readily take up red colour when counter stained with a red dye, *e.g*., neutral red. These bacteria are less susceptible to bacteria.

Gram Positive Bacteria.. Said of bacteria which retain violet colour when stained with a basic dye and mordant even after treatment by decolourizing agent and counterstaining with red dye. These bacteria are more susceptible to antibiotics, detergents etc. but are more resistant to plasmolysis, detergents etc. but are more resistant to plasmolysis than gram negative bacteria.

Graminicolous. Living on grasses, especially of parastic fungi.

Granum (Plural, grana). Plate-like structures in chloroplasts. They are stacked together in groups, and have the chlorophyll distributed over the surface.

Grana. Said of distinct stacks of lamellae seen within the chloroplasts having pigments of photosynthesis, electron transfer compounds and enzymes associated with light-reactions of photosynthesis.

Grasses. A common term used for describing the members of monocotyledonous family Graminae which include about 9,000 species in about 620 genera. They generally have long, narrow, parallel-veined leaves inserted distichously on a round, hollow stem, inconspicuous flowers borne in a terminal panicle, spike or raceme of a number of spikelets.

Grassland. A major regional community which is dominated by grasses. It is common in areas where rainfall is mainly in spring and summer. Temperate grasslands have herbs also with trees that are growing along rivers and streams only *e.g.*, prairies, steppes and pampas.

Green Algae. Used for describing members of division Chlorophyta. They are green pigmented having predominantly chlorophyll *a* and *b*. They store starch as food reserve. They have two, apical, isokont, acronematic flagellla in motile units. The cell wall is made up of cellulose prodominantly.

Green Manure. Any fast-growing, inexpensive crop sown towards the end of season is ploughed into the soil when it is still green so that it may increase soil organic matter on decomposition *e.g.*, *Trifolium*, *Lupinus* etc.

Green Sulphur Bacteria. Used for describing the photosynthetic bacteria of Chlorobiaceae or Chlorobacteriaceae. They obtain hydrogen from H_2S or from other reduced sulphur compounds and fix CO_2 by Calvin cycle.

Gross Primary Production (GPP). Referring to the total amount of energy which is fixed into bond energy of complex organic molecules by producers through photosynthesis in an ecosystem in a unit time. It implies the total production of photosynthates per unit time in the ecosystem and has been found to depend on the photosynthetic efficiency of producers.

Ground Meristem. Those parts of an apical meristem which gives rise to the ground-tissue.

Ground Respiration. The respiration of roots, which is not salt-absorption.

Ground Tissue. The general mass of parenchyma which is present outside and between the vascular strands of a young stem or root:

Growing Point. The apical meristem of axis, in which cell-division occurs, and differentiation begins.

Growing Zone. The portion of an organ in which elongation proceeds.

Growth. Used for describing the increase in size and dry-weight of a plant, or cell, which cannot be reversed. It does not include the increase in size due to the uptake of water.

Growth Correlation. Said of relationship which exists between different growth rates of various parts of a plant body. Growth rates have been found to depend on the balance of growth substances in the region and competition between different parts of the plant for nutrients.

Growth Curvature. Used for describing the curving of an elongating part of a plant organ, due to one side growing faster than the other.

Growth Factor. Any substance affecting growth rate of a plant or its part. This term covers food reserves and minerals and also various growth substances and inhibitors occurred in the plant systems..

Growth Inhibiting Substance. A substance formed inside the cells, which slow down or stop growth, often in some other part of the plant.

Growth Promoting Substance. A substance which tends to promote or accelerate growth. It may be formed inside the plant, or may be obtained from an external source.

Growth Ring. Said of a cyclinder of secondary wood which is laid down in a single season in a stem or root. It is seen as a circle in transverse section, and may not necessarily be the same as an annual ring.

Growth Substance (hormone, phytohormone). Said of any substance which produces marked and specific effect on some aspect of plant growth when present in very low concentrations.

GTP (guanosine triphosphate). A nucleoside triphosphate having the base guanine which is formed from GDP and phosphate during deacylation of succinyl CoA to succinate in TCA cycle.

Guard Cells. A pair of reinform cells which are bounding a stoma. The walls are differentially thickened, and the cells have chloroplasts.

Gullet. Said of an invigination which is present at the anterior end of the cell of euglenoid cell. It has an expanded basal region or reservoir, the cytopharynx and cytosome. In the region without pellicle in the reservoir, particles can be taken into the cytoplasm by endocytosis.

Gummosis. A pathological condition which is usually physiological, or caused by bacteria. The cells dry-out causing an enzymatic break-down of the cell-walls to form a gum.

Gums. These are colloidal plant products, which either dissolve, or swell in water. When hydrolysed they give complex organic acids, pentoses, and hexoses.

Gutta. (1) An oil drop in a spore or fungal hypha.

(2) A general term for a small vacuole.

Guttation. Used for describing the secretion of water from hydathodes, which are commonly present at the end of the main veins of leaves.

Gutter-Pointed. Pointed with the point channelled above to form a spout.

Gynandrous. Said of stamens that are inserted on the gynoecium.

Gynodioecious : Used for plants that bear female and hermaphrodite flowers on separate individuals as in *Thumus*.

Gynoecium (gynaecium) : Used for describing the female reproductive organ in angiosperms which is made up of one or more carpels. It is present in the centre of flower though in more advanced forms it may not be symmetrically placed.

Gynymonoecious. Said of plants bearing female and hermaphrodite flowers on the same individual *e.g.*, many members of Compositae.

Gynophore. Used for describing an extension of the receptacle between and roecium and gynoecium that bears ovary as in many members of Capparaceae.

H

H. A flower-class, including flowers which are usually zygomorphic having a corolla-tube 6-15 mm. long, and suited to pollination by bees.

H-Piece. A short lateral hypha which joins 2 longer hyphae. It is probably aiding in the flow of food-materials through the mycelium.

Habit. The general external appearance of a plant.

Habitat. The immediate environment that is occupied by an organism.

Habitat Form. A plant showing features, which are abnormal, but can be related to the place where it is growing, *e.g.* dwarfing under poor conditions.

Habitat Group. A set of unrelated plants that are occupying the same kind of situation.

Habituation. Said of the process by which an organism gets accustomed to the new environmental conditions to which it has been transferred.

Haem. Used for one of a group of iron-porphyrins, which get conjugated with proteins to form peroxidase, catalase, and all the cytochromes.

Haematochrome. An orange-red pigment which is probably a carotenoid and found in some Chlorophyceae.

Hair. A uni-or multicellular epidermal outgrowth which may be absorptive, *e.g.* root-hair, secretory, protective, or reducing the rate of transpiration.

Half-Inferior. Used for a flower in which the receptacle forms a cup which gets jointed to the base of the ovary and partly up its side.

Half.Race. Used for describing race of plants in which only a few of the seedlings exhibit the characteristic of the race, the others have the ordinary characteristic of the species, and in which selection does not result in the fixing of a pure race.

Halophobe. A plant not growing in a soil having an appreciable amount of salt-water.

Halophyte. A plant living in soil having salt-water in appreciable amounts, where in consequence, there exists a physiological drought.

Halosere. Used for describing set of several communities which are formed during succession in a low lying region of land originally beneath sea and subsequently silted up with mud, silt and shingle and exposed to periodic tides of sea water thereby possessing high salinity in substratum.

Hapaxanthic (monocarpic). A plant bearing flowers only once during its life-span and after fruit formation, leaves fall off and plant dies.

Haplobiont. (1) A plant having only one type of individual in its life-cycle.

(2) Having one type of thallus which is typically haploid.

Haplocheilic. Said of a gymnospermous stomatal complex where subsidiary cells and guard cells are not originating from the same initials *e.g.*, in cycads.

Haploid. Having a single set of unpaired chromosomes.

Haplont. A plant which reproduces sexually, having a diploid zygote, while all the other cells are haploid.

Haplophase. The haploid stage in the life-cycle of plants undergoing an alternation of generations.

Haplopolyploid. A plant that is derived from a polyploid by haploid parthenogenesis, and therefore having half the number of chromosomes of the original polyploid.

Haplosis. Said of the halving of the number of chromosomes at meiosis.

Haplostele. A protostele, having a smooth circular outline in transverse section.

Hapteron. A cell, or cellular organ which is attaching a plant to the substrate. Used especially of the Thallophyta.

Haptonasty. A movement which is induced by touch, but, not influenced by the direction of the stimulus.

Haptonema. Used for describing the thread-like structure that is found between two flagella in the algal members of Haptophyta and not involved in cell movement but remains coiled during cell movement in some cases. It may be used for temporary anchorage.

Haptotropism. A tropism which takes place in response to contact, *e.g.* a tendril twining around the object it has touched.

Hard Bast. Sclerenchyma that is produced in the phloem.

Hard Pan. An impenetrable layer which is formed in the B-horizon of soil.

Hardening. Said of the gradual exposure of a plant to lower temperatures for increasing its tolerance and resistance to frost. Seedlings grown in green houses are usually hardened by placing them in cold frames and gradually increasing the ventilation before they are planted outside.

Hard Seed. Said of any seed which has a tough, impervious outer seed coat that does not allow imbibition and entry of water into the seed. Germination in such seeds needs rupturing of seed coat either by scarification or microbial action as in *Lathyrus odoratus*.

Hardwood. *See* secondary xylem.

Hardy-Weinberg Law. According to this law the random mating of individuals is equivalent to the random .union of gametes.

Hartig Net. In an ectotrophic mycorrhiza, the mycellium inside the cells of the root disintegrates, thereby leaving a network of hyphae in the inter cellular spaces (the Hartig net). From this the mycellium grows out to form a sheath over the root.

Hastate. (1) Having two somewhat out-turned lobes at the base.

(2) Halbert-shaped.

Hatch-Slack Pathway. Describing an alternative form of CO_2 fixation in C_4 plants having first product of CO_2 fixation as 4-carbon oxaloacetate which is formed by carboxylation of phosphoenol pyruvate by PEP carboxylase. Reactions take place in mesophyll cells and products get transferred to bundle sheath cells where they form CO_2 again by decarboxylation which is then fixed by normal Calvin cycle reactions in bundle sheath cells. Pyruvate from bundle sheath cells returns to mesophyll cells to be converted to PEP involving conversion of ATP into AMP. As PEP carboxylase has higher affinity for CO_2 than RuBP carboxylase, C_4 plants have higher efficieney of CO_2 fixation than C_3 plants.

Haulm. A stem of a grass.

Haustorium. A specialized branch of organ of a parasite, which penetrates the host tissue, and absorbs nutrients and water.

Head. A group of conidia and sterigmata crowded into a dense mass, which is rounded in outline.

Heartwood. The central xylem of tree-trunks which is frequently impregnated with tannins, resins etc. It can be considered to be excretory products. It does not have living cells.

Heath. Said of a region which is exposed to strong winds and is having well drained, poor, sandy soil and having absence of trees though region is being surrounded by forests.

Heavy Metal Tolerance. Used for the ability shown by certain plants to grow in areas that are having high concentrations of heavy metals such as copper, lead and zinc where other plants fail to grow.

Helical Thickening (spiral thickening). Said of a type of patterning of secondary wall thickening in tracheary elements in which secondary wall has been laid down in a spiral band. It makes further extension of cell like the annular thickening and is, therefore, occurred in protoxylem elements that are still elongating.

Heliophyte. Used for a plant that shows better growth and therefore, prefers sunny places.

Heliotropism. Used for describing the specific type of phototropism which implies such movement in response to sunlight rather than artificial light.

Helophyte. Describing a marsh plant having its perennating buds which are situated in the mud at the bottom of the pond or lake e.g., *Typha.*

Helotism. A form of symbiosis, in which one partner is benefitted more than the other, e.g. the fungus in a lichen thallus benefits more than the alga.

Hemiangiocarpic. (1) Describing the fruit-body of a fungus, when the hymenium begins its development enclosed, but is exposed at maturity.

(2) Used for a sporocarp, which opens just before it is mature.

Hemiautophyte. A parasite having chlorophyll, so that it can manufacture some carbohydrates.

Hemicelluloses. Said of carbohydrates related to cellulose, but are mixed polysaccharides, having other sugars besides glucose. They get easily hydrolysed by dilute acids.

Hemicryptophyte. A plant having its buds just above, or below the soil-surface, where they are protected.

Hemicyclic. Said of a flower having some parts in spirals, and others in whorls.

Hemizygous. Describing the situation where normal diploid nucleus is having only one copy of a particular gene (or chromosome). Thus the unpaired section of X-chromosome is termed as hemizygous.

Hep. *See* hip.

Herbaceous Perennial. A perennial plant surviving during unfavourable winter as underground perennating organ such as rhizome, corm, bulb or tuber which is producing foliage leaves and flowers only in favourable season but again die at the onest of unfavourable season.

Herbicide (weed killer). Any chemical that on application to a plant, particularly herb, either destroys it or seriously inhibits its growth.

Hercogamy, Herkogamy. Describing the condition of a flower, in which the stamens and stigmas are so placed, that self-pollination becomes impossible.

Heredity. The process by which the qualities of the parents are passed on to the offspring.

Heritability. Describing the proportion of total variance of an observable characteristic which may be accounted for by genetic factors.

Hermaphrodite (monoclinous). A plant having both male and female reproductive organs in the same flower of some individual.

Hesperidium. A fleshy fruit which is formed from a superior, syncarpous gynoecium. The flesh is formed from fluid-filled hairs projecting into the loculi, *e.g.* an orange.

Heterandrous. Having stamens which are not all of the same size.

Heteroblastic Development. Said of progressive change which takes place in the form and size of successive organs as in many grasses. The leaf blades become progressively longer and flowering in the plant starts only after a maximum length gets achieved or as in hemp. Successive leaves are having a greater number of lobes and margins are becoming more serrated. This trend to greater complexity gets often reversed after flowering.

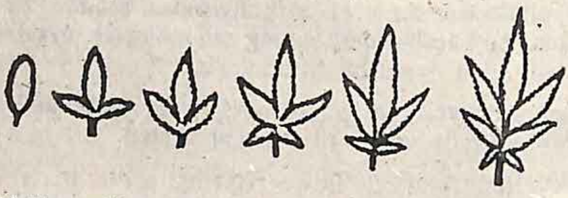


Fig. 16 Heteroblastic leaf development in*Cannabis satiba*

Heterochromatin. Part of a chromosome having no known genes, but differing in nucleic acid content from euchromatin, and staining darker than it. It probably controls the nucleic acid metabolism of the nucleus.

Heterocyst. A special type of cell which is produced in most filamentous Myxophyceae. They differ from the other cells in the structure of the walls and their transparent contents. They function as spores.

Heteroecius. Used for parasitic fungi which produce different forms of spores on different and unrelated hosts.

Heteroecious. A rust fungus in which various spore forms get developed on two different and usually unrelated hosts as *Puccinia graminis*.

Heterofertilization. Said of the fertilization of the endosperm nucleus and egg-nucleus by gametes of different genetic constitution.

Heterogeneous RNA (hnRNA). Used specifically to newly formed intron-containing mRNA

Heterogenic. Of a population, or gamete having more than one allelomorph of a particular gene or genes.

Heteroiçous. Said of the Bryophyta which are having more than one kind of arrangement of the antheridia and archegonia on the same plant.

Heterokaryosis. Of a cell having more than one genetically different nucleus.

Heterokaryotise. Used for describing the fusion of haploid structures of opposite sex, which does not give a conjugate arrangement of the nuclei.

Heterokont. Said of the condition where all the flagella in a cell are of unequal length and usually are of different morphological types also.

Heterolactic Fermentation (mixed lactic fermentation). A type of anaerobic respiration in certain microorganisms having end products as one molecule each of lactic acid, ethanol and CO_2.

Heteromerous. Used for a lichen thallus in which the layer of algal cells is lying between two layers of fungus hyphae.

Heteromorphic (anthithetic). Used for the type of alternation of generations where morphologically different gametophytic and sporophytic generations alternate with each other so as to complete sexual cycle of organism.

Heteromorphous. (1) Existing in more than one form.

(2) Having more than one kind of flower on the same plant.

Heterophylly. Refers to the possession of two or more leaf types. They often differ widely in morphology and function. Heterophylly in aquatic species is shown in Fig. 18.

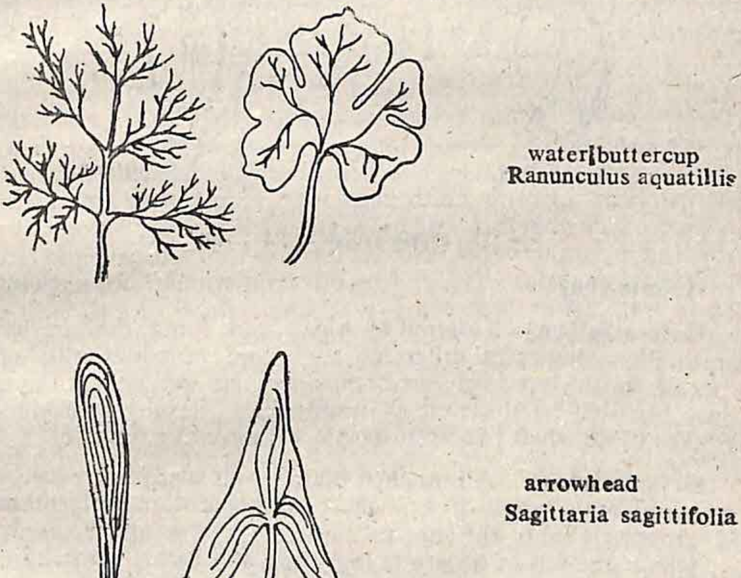


Fig. 17 Heterophylly in two aquatic species.

Hilum. (1) The scar on the testa of a seed where it got attached to the funicle.

(2) The lateral depression in which the flagella are inserted in reniform zoospores.

(3) A small granule at the centre of a starch grain.

(4) The scar on a spore at its point of attachment to a conidiophore or sterigma.

Hip (hep). A type of pseudocarp typical of the members o genus *Rosa* which consists of a large, red, cup-shaped hollow receptacle similar, except in colour and texture, to a pome. The receptacle has a collection of flask-shaped achenes, each covered with small hook-like hairs.

Hispid. Describing structure which is covered with rough or stiff hairs as the leaves of *Crepis setosa*.

Histochemistry. Dealing with the study of distribution of certain chemical substances in cells and tissues by performing their colour reaction with specific chemicals *e.g.*, cellulose by its blue colour which is developed on addition of Schultz's solution.

Histogen Theory. Used for the concept of organization and development of apical meristem in which the meristematic region is differentiated into three main zones, dermatogen, periblem and plerome. Dermatogen forms epidermis, periblem the cortex and plerome all the primary tissues inner to cortex. The theory is now replaced by tunica-corpus theory.

Histology. The science dealing with the study of tissue structure.

Histolysis. The disintegration of tissue, due to the disappearance or solution of the walls or tissues.

Histones. Simple proteins having a relatively high molecular weight, and large variety of amino-acids; but they are highly basic. Histones often occur combined with nucleic acids.

Holdfast. An organ, which is usually branching, attaching a thallophyte to its substrate.

Holoenzyme. A complete enzyme which is made up of an apoenzyme and coenzyme.

Hologamy. Said of the fusion of two mature cells, each of which has been completely changed into a gametangium.

Holophytic. Capable of synthesizing complex molecules from simple ones, thus storing chemical energy, and building new tissues from them. This refers especially to photosynthesis.

Holotype. Used for describing the sole specimen or other element which is either used by or designated by an author as the nomenclatural type of a species when he originally published the description of taxon. Now whenever a new taxon is described, it becomes now imperative to give the designation of holotype and mention of the place of its keeping.

Holozöic. Used for describing organism that gets nourishment in the same manner as the animals *i.e.* ingestion of the food material. Examples of such organisms include animals, fungi, insectivorous plants and parasitic plants.

Homeogenetic Induction. Said of the influence which is exerted by a differentiated cell on an adjacent cell to bring about differentiation of the adjacent cell similar to the differentiated cell, seen in formation of vascular tissues.

Homoeology. Said of the similarity between chromosomes which are derived from different but related species.

Homoeosis. A type of variation in which a plant member is taking on the characters of an unlike member, *e.g.* when a petal changes into a stamen.

Homogamous. (1) Having all the flowers in an inflorescence the same.

(2) Having anthers and stigmas ripening at the same time.

Homoimerous. Used for a lichen-thallus in which the algal and fungal components are mixed, not in layers.

Homokaryotic. Having the same sort of nuclei, as in a line of isolates without variation.

Homologous. Used for structures which are similar, or may be structurally or functionally different, but which have descended from a common type, *e.g.* stamens and staminodes.

Homologous Chromosomes. Chromosomes having identical loci. They get paired in a diploid nucleus, and single in a haploid one.

Homologous Variation. The occurrence of similar variations in related species.

Homonym. (1) The same specific name for the same plant when it is kept in another genus.

(2) A name which has been used earlier in a different sense, and so should not be used again.

Homoplastic. Of the same structure and manner of development, but not descending from a common source.

Homospory. Used for the production of only one type of spores by a species.

Homothallic. Used for describing species in which the thalli are all morphologically, physiologically and genetically similar and fusion can take place between gametes produced even on same thallus as in lower algae and fungi.

Homozygous. Having identical genes at the same locus on each member of a pair of chromosomes which are homologous.

Honey Guide. Lines, dots etc. on perianth lobes that show insects the way to honey.

Hooked Disseminule. A fruit, seed or spore bearing hooks. These aid in dispersal by becoming attached to animals.

Horizon. A stratum of the soil. They start with the A horizon at the surfrce, and usually end with the C horizon, which is the parent material.

Hormogonales. An order of the Myxophyceae. The cells are united in definite trichomes that can always form hormones.

Hormogone. Short sections of the trichome, which are organs of vegetative reproduction in some of the Myxophyceae.

Hormone. An organic substance produced in small amounts at one site in an organism. and transported to another site where it exerts a great effect.

Hornworts (horned liverworts). Used for describing the thallose members of class Anthocerotae of bryophytes which have long-lived axial sporophytes and possess stomata in wall and photosynthesize and occassionally persist even after the death of thallose plant.

Horotelic. Term used in chronistics for describing organisms that show moderate rates of evolution.

Horse Tails. Including about 23 species of genus *Equisetum* of sphenopsida that are having aerial jointed stem arising from a creeping perennial rhizome and bearing whorls of reduced leaves at each point.

Hose-in-Hose. A flower that is having an extra set of petals within the whorl of normal corolla as seen in some azalea varieties.

Host. The organism providing nourishment, shelter or some other benefit to another organism at its own cost but deriving no benefit from the other organism

Hummock and Hollow Cycle. Used for describing a cyclic successional change in vegetation seen on a developing raised bog.

Humus. The organic matter present in the soil which is formed by the decomposition of plant and animal remains. It contains a large number of elements necessary for plant-growth, and its colloidal mature improves the texture of the soil, and its water-retaining capacity.

Humus Nucleus. A combination of lignin and protein, which forms the basis of humus.

Humus Plant. A flowering plant that is often poorly provided with chlorophyll, and grows into deep humus. Its roots then form a mycorrhiza having a fungus.

Hyaline. A structure which is thin and translucent.

Hyaloplasm. *See cytoplasm.*

Hybrid. Used for the offspring of two related individuals of the same species, race, or variety.

Hybridization. The production of a hybrid by carrying out cross between two individuals of unlike genetic constitution.

Hybrid Sterilty. Used for describing the phenomenon or reduced ability of some hybrids to produce viable gametes. It is caused by absence of homologous chromosomes; in the hybrid so that bivalants cannot be formed at meiosis and resulting gametes become aneuploids.

Hybrid Swarm. Used for describing the continuous and variable series of hybrids between two originally different parental forms which are occurring due to break-down of reproductive barrier between two distinct populations.

Hydathode. A water-secreting gland which is found on the edges and tips of leaves of many plants.

Hydrarch Succession. Used for describing the succession involving successive replacement of relatively more hydrophytic communities by relatively lesser hydrophytic communities one after the other during succession and stablization of a hydric habitat.

Hydrocarpic. Used for aquatic plants which ripen their fruits under water after pollination has taken place in the air above.

Hydric. Said of condition of a habitat in which environmental factor dominating other factors is water *e.g.*, ponds, lakes, rivers etc.

Hydroid. Used for describing an elongated, non-lignified, water conducting cell in 'stems' and 'leaves' of certain Bryophytes, usually the mosses. It is analogous to tracheary elements of vascular plants.

Hydrolase : An enzyme catalysing the hydrolysis reactions.

Hydrophily. Used for pollination which is caused by agency of water. Pollens of plants with hydrophily need to be very light and water resistant.

Hydrophyte. A plant that is adapted to living in water, especially a vascular plant.

Hydroponics. Used for the large scale culture of plants, using solutions as the sole source of nutrient salts.

Hydrosere. A sere beginning in a wet habitat.

Hydrotropism. Used for describing a type of tropic movement in response to water. It is a chemotropism in which plant organ gets oriented according to water. Most roots are positively hydrotropic showing growth towards water and shoots are negativaly hydrotropic showing growth away from water.

Hygroscopic. Used for describing anything that readily absorbs water from its surrounding environment e.g., seeds prior to germination.

Hymenium : In higher fungi, it represents a fertile layer which comprises (in Ascomycetes) and basidia (in Basidiomycetes), usually having interspersed sterile paraphyses. It lines the ascocarp or basidiocarp and at maturity, may get exposed as in Discomycetes and Hymenomycetes or remain enclosed as Plectomycetes, Pyrenomycetes and Gasteromycetes.

Hymenophore : The fruiting body of Hymenomycetes.

Hypanthium. Used for the flat or cup-shaped receptacle which is found in perigynous flowers and joined to ovary when ovary is inferior,

Hypanthodium. The deeply hollowed receptacle of the fig.

Hyperbasal Cell. One of the two lowermost cell of the developing sporophyte of bryophytes and pteridophytes. It usually develops into part of the seta and root.

Hyperchimaera. A chimaera in which the components get intimately mixed.

Hyperdiploidy. Describing the condition where the full diploid complement of chromosomes is present, as well as a portion of one chromosome which gets translocated.

Hyperplasia. Said of the abnormal increase in the size of a tissue by cell-division.

Hypersensitivity. Used for describing a method of resistance to invasion by an obligate parasite. The first few host cells that are invaded first die rapidly, thereby removing the food-supply for the parasite, which consequently dies.

Hypertonic. Of a solution, having an osmotic pressure more than the one with which it is being compared.

Hypertrophy. The abnormal increase in the size of a tissue which takes place by enlargement of the original cells.

Hypha. An individual filament of a fungus thallus.

Hypnospore. Used for unicellular, thick-walled, uninucleate, non-flagellate and non-motile resting spore which is formed in many algae.

Hypobasal Cell. Inner of one of the two cells which are formed by first division of zygote.

Hypocotyl. The part of a seedling axis between the radical and the cotyledon(s).

Hypoderm, Hypodermis. A layer of one, or more cells thick, of thikened cells which is lying immediately below the epidermis.

Hypogeal Germination. When germination takes place, the cotyledons stay below the ground.

Hypogenous. Produced lower down.

Hypogyny. Used for the arrangement of flower parts in which stamens, sepals and petals get inserted below the level of insertion of ovary. Such flower is known as hypogynous.

Hyponasty. Used for the lower side of an organ which is growing more quickly than the upper, thereby resulting in an upward bending.

Hypophloeodal. Growing just within the surface of the bark.

Hypophyllous. Attached to, or growing on the under-surface of a leaf.

Hypoplasia. A state of having growth less than others. Developmental deficiency.

Hypoploids. Diploids which lack a piece or pieces of chromosomes from their complement.

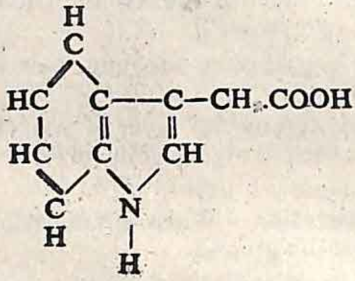
Hypostasis. Said of the situation in which expression of one gene (*hypostatic gene*) depends on a second gene (***epistatic gene***). The two genes may or may not be lying on the same chromosome.

Hypotonic. A solution having a smaller osmotic pressure than that of the solution with which it is being compared.

Hypotrophy. Eccentric thickening of the underside of an approximately horizontal shoot, or root.

I

IAA, Indole Acetic Acid. A plant hormone which causes elongation of cells, when it is present in suitable concentrations.



β-Indoleylacetic acid

IBA, Indole Butyric Acid. A plant hormone.

Idioblast. (1) A supporting cell which is found among chlorophyllaceous tissue. It does not have chlorophyll, has thick walls. and is usually elongated.

(2) Any cell that varies in cell-content, and wall thickness from its neighbours.

Idiochromatin. A substance within the nucleus of a cell, which controls the reproduction of the cell.

Idiogram. See karyogram.

Imbibition. This takes place when a solvent enters a colloid, between the free capillary spaces, and the inter-micellar spaces. It causes the colloid to swell, (and ultimately to be dispersed). The swelling causes considerable pressure—the *imbibitional pressure*,

Imbricate. Overlapping like the tiles of a roof. This term is generally used to describe aestivation in calayx and corolla of flowers in which one or more sepals or petals totally overlap the neighbouring one.

Immunity. Said of the ability to prevent invasion by a pathogen. It is of three types; (*a*) **Structural**, *e.g.* a thick cuticle may prevent the penetration of the fungal hyphae; (*b*) **Physiological**, *e.g.* the protoplasm is an unfavourable environment for the development of the parasite; (*c*) **Acquired**, *e.g.* plants attacked by a mild strain of a virus, which appears to have no ill-effects, may be immune to the attack of a more virulent strain.

Imparipinnate. Said of a pinnate leaf, which possesses a terminal leaflet.

Imperfect Flower. A flower lacking either anthers or carpels, or if they are present, they are non-functional.

Imperfect Fungi. Used for describing members of artificial division Deuteromycotina also called Fungi Imperfecti.

Importance Value Index (IVI). Representing a quantitative character which is used in the description of community structure. It is derived from addition of relative frequency, relative density and relative dominance of a population. Its scale is, therefore, out of 300 and its calculation is carried out for each population of community separately. This character provides the idea of actual importance of a population in the community structure.

Inbreeding. Used for the raising of progeny of mating of two or more closely related gametes or zygotes.

Inbreeding Coefficient. A measure of the intensity of inbreeding.

Incidental Solar Radiation (ISR). Describing the total amount of radiant energy of sun which is available to producers in an ecosystem per unit time that can be fixed into bond energy of complex organic molecules through photosynthesis.

Incipient Plasmolysis. The condition when about half the cells of a tissue get plasmolysed. It is in this condition that the osmotic pressure of cell-sap is generally measured.

Incompatibility. (1) The failure of self-or cross-fertilization by reason of genetic similarity, within an otherwise freely inbreeding group.

(2) Differences in the physiology of a host and parasite which inhibits or stops the growth of the latter.

Incomplete flower. A flower lacking sepals or petals or both.

Incomplete Dominance. (Partial dominance). Said of the condition in certain heterozygotes in which both contrasting alleles of a gene are present and both are able to partially express themselves so that phenotype is of character which is intermediate between both homozygotes of both alleles e.g. in *Antirrhinum* ++ homozygote is having red flowers and ww homozygote is having white flowers while +w heterozygote is having pink flowers.

Incubation Period. The time between the inoculation with a pathogen, and the development of symptoms.

Incubous. Used for describing the 'leaf' of a liverwort, when its upper border, (*i.e.* the border towards the apex of the 'stem') is overlapping the lower border of the next leaf above it, and on the same side of the stem.

Incumbent. (1) Lying on.

(2) Said of a radical which is bent back to lie on one of the cotyledons.

Indefinite Growth. Means the ability of certain plants or plant organs to grow without limit continuously for indefinite period, *e.g.*, trees and leaves of monocotyledons.

Indefinite Inflorescence. *See* racemose inflorescence.

Indehiscent. Said of a fruit or fruiting body that does not open to disperse its contents. Such bodies are probably believed to have developed from suppression of naturally occurring opening mechanisms which are found in dehiscent structure.

Independent Assortment. Used for the separation of alleles of a pair during meiosis independently of the separation of alleles of another pair in the organism. Hence, in a heterozygote, for two characters AaBb, four types of gametes get formed after meoisis having equal frequencies (AB, Ab, aB, ab). The law of independent assortment was given by Mendel (second law of Mendel) but it holds true only when two genes are not linked.

Indicator Plant. A plant growing under special conditions of climate, or in a particular soil, or in a particular community, and thus, by its presence, indicates the general nature of the habitat.

Indicator Species. Said of a species which has a highly characteristic response of its presence or absence in particular environmental condition. Hence the presence or absence of species can be used as an indicator of the environmental conditions which are prevailing in the area *e.g*, presence of *Sphagnum* moss reveals very alkaline conditions of substratum.

Indifferent Species. A species occurring in two or more distinct communities.

Indigenous. Native to an area which is not introduced.

Induced Enzyme (adaptive enzyme). An enzyme which gets synthesized in response to high concentration of its substrate (*See* induction). In absence of substrate, genes governing enzyme synthesis get repressed.

Inducer. A substance promoting the activity of a gene or a group of genes.

Induction. A process in which de novo synthesis of an enzyme or group of enzymes gets stimulated by the presence of substrate in the cell *e.g.*, there occurs an increase in β-galactosidease synthesis in cells of *E. coli* when cells have been supplied with lactose as the sole carbon source.

Indumentum. Said of the dense or sparse covering usually of hairs.

Indusium. Said of flap-like covering of tissue which partially or completely covers the sporangia in a sorus in certain ferns. It may be outgrowth of placenta (*true indusium*) or formed by curving of laminar margin (*false indusium*).

Inferior Ovary. Used for describing condition of ovary in angiospermic flower in which sepals, petals and stamens get inserted above the level of ovary.

Inflorescence. Said of the system which consists of more than one flower in many angiosperms in which flowers are borne on a special *inflorescence axis*. separated from vegetative parts by an extended internode.

Infraspecfic Variation. Used for describing the difference in appearance exhibited by individual members of the same species or breeding population due to either environmental influences such as nutrition, competition, seasonal effects etc. or due to genetic factors such as the genetic recombination and mutation.

Infructescence. Used for describing the inflorescence after the flowers have fallen, and the fruits get formed.

Infundibuliform. Tubular below, gradually opening upwards, *i.e*. funnel-shaped.

Inhibitor. A substance limiting or destroying the catalytic activity of an enzyme.

Initial (initiating cell, meristematic cell). Used for describing any actively dividing cell in a meristem. After each division in initial, one daughter cell retains meristematic activity to form new initial while other daughter cell differentiates to form a cell in the plant body. The initials are usually having a dense cytoplasm.

Initial Cell. A cell which remains meristematic, divides repeatedly, and gives rise to many daughter-cells, from which, after further division, the permanent tissues of the plant get differentiated.

Innovation. (1) An accessory branch which is produced in some mosses, after the sporangium get developed.

(2) A newly-formed shoot which is formed during one-season.

Inoculation. (1) The conveyance of an infection to a host plant by any means of transmission.

(2) The entry of the germ-tube of a parasitic fungus into a host.

(3) The placing of spores, or piece of mycelium of growing fungi, or bacteria, into a culture medium.

Inoculum Potential. The energy of growth of a fungus, or other microorganism which is available for the colonization of a substrate.

Insecticide. Any chemical killing insects. The term is usually applied to chemicals that kill mites, nematodes and other invertebrate pests.

Insectivorous Plant (carnivorous plant). A plant adapted to derive food by trapping, killing and digesting small animals in addition to normal photosynthesis. Such plants generally occur in areas of nitrate deficiency particularly. Examples are *Drosera*, *Nepenthes* etc.

Insect Pollination. *See* entomophily.

Integument. Said of protective structure that develops from the base of an ovule and encloses it almost completely except at an opening at the tip of nucllus (at micropyle).

Integument. (1) The membrane(s), enclosing the nucellus, finally forming the testa. (2) The membrane enclosing the female gameteophyte in the Lepidocarpales.

Interaction of Genes. Used for describing the process by which one gene-difference affects the expression of another gene-difference.

Interbreeding. Experimental hybridization involving different species or varieties.

Intercalary. (1) Describing a meristem occurring between non-dividing tissue.

(2) Lying between other bodies of a row, or placed somewhere along the length of a stem, filament, or hypha.

Intercalary Meristem. A meristem which is located somewhere along the length of a plant member, and by its activity giving *intercalary growth.*

Intercalary Plates. A layer of plates lying between the apical and precingualar plates of the cell-wall of the Peridiniales.

Interchange. Describing an exchange of non-homologous terminal segments of chromosomes.

Interfascicular Cambium. A strand of cambium present between two adjacent vascular bundles. The formation of interfascicular cambium constitutes the first stage in the normal secondary thickening of a stem.

Interference. The property by which one cross-over interferes with the occurrence of another cross-over in its neighbourhood.

International Code of Botanical Nomenclature (ICBN). A periodically revised publication which briefs the procedure of scientifically naming the plants. For vascular plants, it states that first valid names published on or after 1st may 1753 should be retained. If circumscription, position and rank of a group have been decided, it can only have one correct name. The code is applicable only to wild plants. Rules for cultivated plants are guided by rules laid down in 57 Articles in International Code of Nomenclature of Cultivated Plants (ICNCP).

Internal Phloem. A phloem which is lying between the xylem and the centre of the stem.

Internode. (1) The stem between two successive nodes.

(2) The part of the thallus of the Charales, where the branch-like filaments arise.

Interpetiolar. Between the petioles.

Interphase. The resting stage occurring between the first and second meiotic divisions.

Interpositional Growth. *See* intrusive growth.

Intine. Used for describing the innermost layer of pollen wall which is present beneath the exine and composed mainly of cellulose. As it is less resistant than exine, it is not preserved in pollen fossils.

Intracellular. Used for structures or processes which are situated or taking place within the cell.

Intracellular Cambium. *See* fascicular cambium.

Intraspecific Selection. Used for describing natural selection which are occurring among the individuals of the same species.

Intrazonal Soil. Used for describing the order of soil types according to soil classification USDA revised system of Thorp and Smith (1949). This reflects some local factor, other than the climate of the zone *e.g.*, nature of parent rock, possesses dominant influence on the soil development. Suborders halomorphic, hydromorphic and calcimorphic, have been recognized in this order, each having many soil groups.

Introgression. (introgressive hybridization). Used for describing the phenomenon of incorporation of genes of one species or subspecies into other related species or subspecies. It takes place as a result of successful hybridization and successful backcrossing of hybrids with one of the parental population.

Intron. Said of a non-coding polynucleotide sequence situated between two coding regions (exons) of DNA. It is present in eukaryotic cell but not in bacterial cell. Length and number of introns in a gene varies. In some genes, introns are absent.

Introrse. Used for anthers that release their pollen towards the centre of the flower thus promote self polination. *Compare* extrorse.

Intrusive Growth. (Interpositional growth.) Said of the growth that is exhibited by certain cells when they intrude between other cells that are either growing at a slower rate or not growing at all.

Intussusception. Used for describing the insertion of cellulose into spaces within the wall of an elongating cell. Water enters the cell vacuole, creates outwards pressure on the wall and this stretches the wall due to which cellulose gets incorporation resulting in increase in area of the wall. Next step is generally the thickening of wall by apposition.

Inulin. Said of a storage polysaccharide made up of fructose residues which are linked by β(2-1) glycosidic bonds and about 30-40 residues in length. The chain is usually headed by glucose residue and is synthesized from sucrose precurssors.

Inversion (chromosomal inversion). Used for structural change in chromosome which involves detachment of a piece of chromosome and its reattachment to the same chromosome having ends of detached portion in opposite direction of the original thereby causing an inversion in the sequence of gene in that segment of chromosome. Inversion may be pericentric or paracentric.

In Vitro. Said of experiments on biological processes which are carried out in laboratory apparatus, outside their natural place in the living organism.

In Vivo. Said of experiments investigating biological processes which are carried out in the living organism.

Involucre. 1. Used for the whorl or bracts around or beneath a condensed inflorescence such as a capitulum or umbel which is resembling and carrying out the function of calyx. 2 Said of the sheath surrounding a group of archegonia or antheridia in certain liverworts such as *Sphaerocarpus*. 3, Said of the tubular upgrowth of thallus which is surrounding the base of bryophyte in members of Anthocerotae.

Iron Bacteria. Used for describing the bacteria of order Chlamydobacteriales which are rod-shaped gram negative and aggregate into filamentous structures that sometimes may get branched. The filaments are surrounded by a sheath of organic matter which is impregnated with ferric and manganese oxides. Bacteria derive energy by bringing about oxidation of organic substrate as well as ferrous compounds into ferric oxides, probably deriving additional energy from these reactions.

Irritability (Intensity). Said of any organism or responding to some external stimulus. In plants, response takes the form of various types of moments which are caused by bending of growing region.

Isidium. Said of an outgrowth from a lichen plant having both algal and fungal cells that may detach and form a new lichen thallus vegetatively. Isidia may be coral-like or bud-like.

Isochromosome. Said of a metacentric chromosome in which two arms are genetically identical to each other.

Isoenzyme. Said of any of the multiple forms of an enzyme each of which possesses different characteristio kinetic properties. Such enzymes are usually obtained by different combinations of the same two or more subunits.

Isoflavones. Used for the isomers of flavones which are having B group of flavonoid nucleus attached to third rather than second carbon atom of central C_3 group. They are particularly common in Leguminosae. Some have oestrogen-like activity.

Isogamy. Said of the fusion between gametes which are identical in morphology and exhibit equal motility in sexual reproduction.

Isokont. Said of flagella in which all flagella present in a cell are of equal length and usually of some morphological form.

Isolating Mechanism. Any of the mechanisms which is serving as a reproductive barrier for gene flow between all the members of a population. Such mechanisms may arise in many ways e.g.. allopatry, different flowering times or different pollinators etc.

Isomerase. Any enzyme calalysing the conversion of a molecule of substrate from its one isomeric form to other form.

Isomorphic. 1. Said of organism or organ that exists in only one form. *Compare* dimorphism, polymorphism. 2. Said of (homologous) alternation between morphologically identical gametophytic and sporophytic generations so as to complete the sexual cycle. *Compare* heteromorphic.

Isonome Method. Used for a technique of studying plant distribution in a particular area which is having obvious variations in species composition. This study is done by laying continuous quadrates in the chosen area and recording abundance of each species in quadrat. Abundance values of each different species are then made to plot on separate pieces of squared paper and isonomes are constructed by joining up roughly equal abundance values.

Isoquinoline Alkaloids. Said of a group of alkaloids which are having structure based on isoquinoline nucleus and derived from amino acid tyrosine and phenylalanine e.g., morphine or curare.

Isotonic. Said of the two solutions having same osmotic pressure. *Compare* hypertonic, hypotonic.

Isotopic Tracer. (tracer). Said of any stable or radioactive isotope which is used to label a metabolite by incorporating it in place of normally incorporated isotope. Consequently it could be followed in the metabolic pathway in the living organism e.g., ^{14}C isotope is incorporated into CO_2 taken up by a plant in photosynthesis to know the photosynthetic pathway.

Isotype. Said of duplicate specimen of holotype of a taxon (*See also* holotype) which is collected at the same time and from the same place as the holotype and deposited usually in some place other than that of holotype.

Isozyme. *See* isoenzyme.

Isthumus. The narrow central portion which is connecting two halves of a placoderm desmid.

J

Jacket. Any layer of tissue which is covering an archegonium, capsule, or sporogonium.

Jacket Cell. An outer cell which is usually of a reproductive organ.

Jamin's Chain, Jaminian Chain. A series of short threads of water which are separated by bubbles of air, in the vessels of plants.

Jacob-Monod Model (operon model). Said of model explaining regulation of gene action. It was proposed by F. Jacob and J. Monod in 1960. This model is well substantiated in prokaryotes but not in eukaryotes to sufficient degree. According to this model, cell metabolism is regulated by control of quantity of enzymes synthesized which in turn gets regulated by regulation of m RNA synthesis for the enzyme concerned. Thus cell gets regulated at the level of transcription. A parallel model is also postulated for eukaryotic cells which takes into account the very different organisation of their chromosomal DNA. *See* repeated sequence. *See also* operon.

Jungle. Said of low or thin forest.

Jurassic. A geological period which is extending from approximately 140 to 170 million years ago.

Juvenile Form. A young plant having leaves and other features different from those of a mature plant of the same species.

Juvenile Leaf. The form of leaf found on a sporeling or seedling, when it is different markedly from the leaf of the adult plant.

Juvenile Stage. A special stage in the life-history of some aglae from which the ordinary plant is developed as an outgrowth.

Juvenility. The condition expressed in immature organisms, which are generally smaller in size than the adults and lack reproductive capability. The seedling represents the juvenile stage of many plants. Juvenile leaves are different from mature leaves.

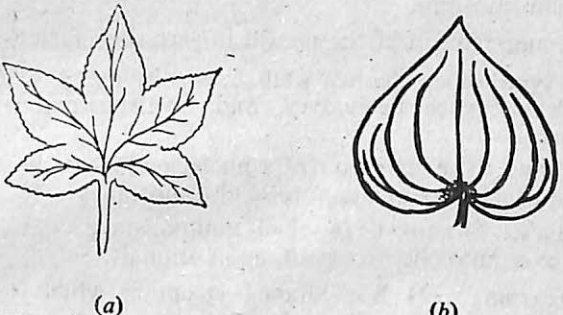


Fig. 19. Juvenile (*a*) and mature (*b*) leaves of ivy.

K

Kampf Zone. Describing the zone of elfin forest. *See* elfin forest.

Karyaster. A group of chromosomes which are arranged like the spokes of a wheel.

Karyogamy. (1) The dividing of a nucleus into two, passing to the opposite sides of the cell.

(2) The union of two nuclei, especially gametic nuclei.

Karyogram (idiogram). Used for a diagram or photograph of chromosomes at mitotic metaphase present in the somatic cell of an individual in which chromosomes get arranged in homologous pairs in an agreed conventnional sequence.

Karyokinesis. Used for the process of nuclear division which precedes cytoplasmic division. *See* mitosis.

Karyolymph. The matrix which is lying in the reticulum of the nucleoplasm.

Karyomere. A swollen condition which is sometimes seen in chromosomes towards the end of a nuclear division.

Karyoplasm (Nucleoplasm). Used for the substance of nucleus apart from the chromatin that is having complexes and enzymes necessary for the replication of DNA and synthesis of RNA molecules.

Kataphase. The stages of mitosis from the formation of the chromosomes up to the division of the cell.

Karyosome. (1) A nucleus.

(2) A chromosome.

(3) An aggregation of chromatin in a resting nucleus.

(4) A type of nucleolus well-shown by many of the lower plants which stain with basic dyes, and furnishes material for the chromosomes.

Karyotype. The character of a nucleus which is defined by the size, shape, and number of the mitotic chromosomes.

Katabions. Organisms in which katabolism processes are predominating over anabolic processes, as in animals.

Keel (carina). (1) Boat-shaped structure which is formed by fusion of two lower (anterior) petals in flower with papilionaceous corolla around the stamens and gynoecium.

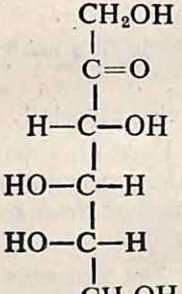
(2) Used for describing any ridge-like structure.

Kelps. Used for algal plants of order Laminariales of Phaeophyata which is having the largest known algae *Macrocystis* and *Nereocystis*.

Kernel. (1) The seed inside the stony endocarp of a drupe.

(2) An obsolete term for the nutritive tissue and asci in perithecium.

Ketose. A hexose having sugar a =O group on the second carbon atom, and no HO group on the first one, *e.g.*, fructose.



$$\begin{array}{c} CH_2OH \\ | \\ C{=}O \\ | \\ H{-}C{-}OH \\ | \\ HO{-}C{-}H \\ | \\ HO{-}C{-}H \\ | \\ CH_2OH \end{array}$$

Kinase. The enzyme catalysing the transfer of phosphate to ADP, forming ATP.

Kinetic Body. A small granular body lying where a chromosome gets attached to the spindle.

Kinetic Constriction, **Kinetochore**. The portion of a chromosome in which the attachment is made to a spindle fibre.

Kinetomeres. Molecules of protoplasm which may be energy-rich and reactive, energy-poor and stable.

Kinetosome (basal body, blepheroplast). Said of the cylindrical structure in cytoplasm present at the base of each flagellum or cilium in motile eukaryotic cells. It is composed of a cylinder of nine microtubules which are linked by fine cross bridges. It transfers ATP and possibly other materials to the fibres in the shaft of flagellum or cilium.

Kingdom. The highest rank in the hierarchy of taxonomic ranks.

Kinins. A group of plant hormones, which are particularly important in influencing the rate of mitosis. Found in young developing tissue and embryos.

Kino. A resin-like substance which is soluble in water, astringent, used medicinally and in tanning.

Kinoplasm. Protoplasm which is composed of fibrils and which in cell-division composes of the spindle-fibres, attraction sphere, and astral rays.

Klinostat (clinostat). An apparatus for studying the plant growth in absence of directional stimulus. It consists of an electrically or mechanically driven motor that rotates a plateform to which plant or seedling being gets attached in some manner. The rotation of plateform prevents uninterrupted exposure of unidirectional stimulus to a plant part.

Kranz structure. A type of organisation or photosynthetic tissue which occurs in leaves of grasses (and leaves of C_4 dicotyledonous plants) in which bundle sheath cells are larger and have chloroplasts surrounded by one or many layered halo of mesophyll cells. Bundle sheath chloroplasts have been specialized, elongated, without grana but capable of forming starch grains. Mesophyll chloroplasts have been found to be structurally similar to those of C_3 plants but do not form starch grains. In mesophyll cell chloroplasts, CO_2 reacts with phosphoenolpyruvate to form oxaloacetate which gets transported to bundle sheath chloroplasts where CO_2 is again released and gets refixed by normal Calvin cycle reactions.

Kreb's cycle (TCA cycle, citric acid cycle). Describing the cyclic sequence of reactions occurring universally in organisms that respire aerobically. In this cycle acyl portion of acetyl CoA gets oxidized completely into CO_2 and hydrogen ions reduce FAD and NAD into $FADH_2$ and $NADH_2$ thereby conserving the energy released in oxidation of acetyl portion. Acetyl CoA enters the cycle by being reactive with oxaloacetate to form acetate and frees CoA-SH and subsequently forms cis-aconitate which by involving a series of compounds, again yields the oxaloacetate. Cycle is *amphibolic* pathway having both catabolic and anabotic functions.

Krummholz : *See* elfin forest.

L

Labelling. Means the incorporation of an isotopic tracer in a compound so that it becomes possible to trace the fate of the compound in the metabolism of an organism.

Labellum (lip). 1. Said of the platform formed by the lower petal or group of fused petals in lipped flowers as in Labiatae. 2. Used for the lower of the 3 petals in an orchid flower which is different in morphology and patterning from two lateral petals and gives flower its characteristic form.

Labiate. Said of a corolla in which one or more petals are formed into a lip.

Lactic Acid Bacteria. Describing a group of gram positive anaerobic bacteria that uses pyruvic acid as acceptor of hydrogen formed in glycolysis and produces lactic acid from it e g., *Streptococus lactis.* Most of such bacteria are rod-shaped belonging to family Lactobacillaceae of order Eubacteriales.

Lactic Dehydrogenase. The enzyme which reduces pyruvic acid.

Lactoflavin. A yellow pigment which is produced by *Eremothecium ashbyii*.

Lacuna. (1) A large multicellular cavity.

(2) A depression in the surface of a plant.

(3) A cavity which is formed in rapidly elongating stems by the breakdown of the protoxylem.

(4) Any cavity in a plant.

Lagging. Said of the slow movement towards the poles of the spindle by one or more chromosomes in a dividing nucleus. As a result of this the chromosomes do not become incorporated into a daughter nucleus.

Lag-Period. Describing the period between the initial inoculation of a culture medium with an organism, and the resumption of normal growth.

Lamarckism. The theory postulating that acquired characters are inherited during sexual reproduction.

Lamella. (1) A plate-like structure.

(2) A gill of an agaric.

(3) The plate-like structure in the grana and stroma in the chloroplast.

Lamina. (1) The flattened part of a leaf.

(2) Any flattened part of a thallus.

Laminarin. A polysaccharide storage-product occurring in the brown-algae. It is composed of β-D-glucopyranose units, linked in the 1 : 3 position.

Laminated Bulb. Said of a bulb which is composed of a number of swollen leaf-bases, each of which completely encloses all parts of the bulb inside it, *e.g.* an onion.

Lanate, Lanatus (Latin), Lanose, Languinose. Covered with long, and loosely tangled hairs.

Lanceolate. Said of flattened, two or three times as long as broad, widest in the middle and tapering to a pointed apex.

Landrace. An ancient, primitive cultivar of a crop plant which shows much genetic heterogenity and having numerous alleles contributing to the survival of the organism under natural condition. Landraces form a source of alleles for plant breeders.

Late Blight. Said of disease of potato which is caused by fungus *Phytophthora infestans* having blight-type symptoms.

Latent Infection. The state of pathogen infection during which pathogen has stopped growth just after penetration of host which does not exhibit any visible symptoms. After the latent period, pathogen regains the growth and then the host exhibits characteristic symptoms.

Lateral Conjugation. Describing a form of conjugation in certain filamentous algae, particularly of Zygnematales, in which there occurs the formation of conjugation tube between two adjacent cells of the same filament.

Lateral Meristem. A meristem which is located at the side of a plant member.

Lateral Root. Any root arising endogenously from the pericycle of another root.

Laterite. A term is mainly applicable to tropical red soils, with various definitions, but basically the two following conditions are necessary :

(1) In deep horizons, the parent rocks are permanently saturated with water, and have iron compounds which dissolve.

(2) In higher zones, where ferrous substances get oxidized as they are in contact with air. The top layer is usually brick-hard, and of ferruginous material.

Latex. A milky fluid having sugars, proteins, alkaloids, oils, etc. It is produced in latex vessels of many plants.

Latex Cell. A simple or branched cell which is derived from the enlargement of a single cell, and contains latex.

Latex Duct. An elongated, branched, aseptate system of nastomosing hyphae, which contains latex, and is present in some f the larger agarics.

Latexosis. An abnormal secretion of latex due to a pathoogical condition.

Latex Vessel. Used for describing a simple, or branched tube, sually anastomosing with other similar tubes, derived from the nlargement and union of a chain of cells, and containing latex.

Laticifer. A cell or linked system of cells having latex and enetrating into various tissues in certain plants. Laticifer of a ingle cell is known as *simple*, of joined complex of cells is known as *compound laticifer.*

Latin Square. An experimental design in which the number of treatments is equal to the number of replications and each treatment is taking place only once in every row and column.

Latosol. A soil which is formed by laterization having a leterite.

Layer. A stratum of vegetation, as the shrubs in a wood.

Layering. (1) The banding which is seen in thick cells-walls, due to the presence of wall-layers differing in water-content, chemical composition, and physical structure.

(2) The grouping of vegetation in a wood into 2 or more well-defined layers differing in height, as trees, shrubs, and ground vegetation.

(3) A method of artificial propagation in which stems pegged down until they root, and then detached from the parent plant.

Leaching. Used for the removal of mineral salts from the soil by percolating water.

Leader. One of the main shoots of a tree.

Leaf. Used for describing an outgrowth from the stem of a vascular plant. It is usually green and mainly concerned with photosynthesis, and transpiration. It consists of a leaf-base, petiole, and flattened lamina, which is usually conspicuously veined.

Leaf Area Index, LAI. Defined as the ratio of total surface of a plant's leaves to the ground area that is available to that plant *i.e.* LAI=leaf area/basal coverage of plant.

Leaf Area Ratio. Describing the value which is derived by dividing the total surface area of all the leaves of a plant by its total dry weight.

Leaf Buttress. A lateral prominence on the apex of shoot which is finally differentiated into a leaf.

Leaf Canopy. Used for the total foliar coverage of a plant. This term usually refers to the unbrella of foliage in a large tree.

Leaf Culture. Describing the culture of excised leaf, leaf material or leaf primordia on a sterile growth medium by fusing tissue culture techniques.

Leaf Curl. Used for a plant disease which shows curling and puckering of leaves in infected plant. It has occurred due to an increase in cells on either side of midrib and extra growth of palisade and spongy mesophyll *e.g.*, in peach and almond caused by fungus *Taphrina deformans*.

Leaf Fall. Used for describing the detachment and shedding of leaves from a plant due to formation of abscission zone at the base of petiole. Leaf fall is associated with fall in level of auxin in lamina.

Leaf Gap (lacuna). Said of the parenchymatous area in the stele of many vascular plants which is associated with and positioned immediately above a leaf trace.

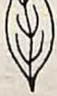
Leaflet. One separate portion of the lamina of a compound leaf.

Leaf Mosaic. Used for describing the arrangement of the leaves on a shoot or a plant in such a way that as much leaf as possible gets exposed to light, and as little as possible gets shaded by other leaves.

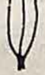
Leaf Primodium. Used for describing localized mass of meristematic tissue near the apical meristem. It ultimately divides to form a leaf.

Leaf Scar. The scar on a stem which is left after the leaf has fallen. It is commonly covered with a layer of cork.

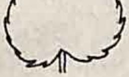
Leaf Scar Periderm. A periderm which is developing across a leaf-scar beneath the initial protective layer.



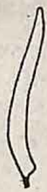
Lanceolate



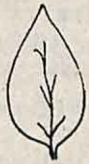
Linear



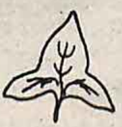
Cordate



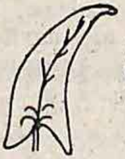
Acicular



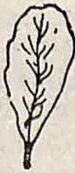
Ovate



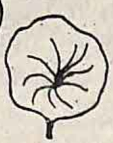
Hastate



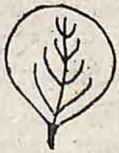
Sagittate



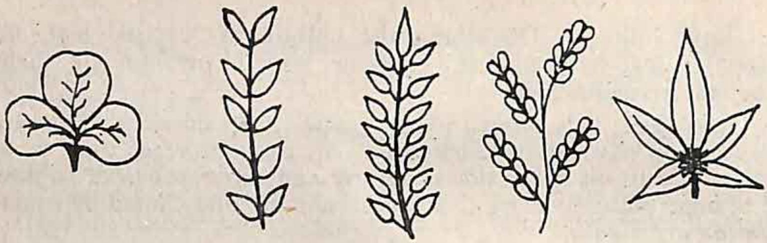
Spatulaet



Petlate



Orbicular



Trifoliate Paripinnate Imparipinnate Bipinnate Palmate

Fig. 20. Leaf Shapes.

Leap Shapes. The common leaf shapes are shown in Fig. 20.

Leaf Sheath. (1) An expansion of the petiole or leaf-blade to surround the stem.

(2) Scale-like leaves growing over the apical cell of a stem of the Equisetaceae.

Leaf Spot. Describing a plant disease which is characterized by limited areas of necrosis on leaves forming spots on it. It is caused by mineral imbalance, insects, weather conditions, viral, fungal or a particular phase of a disease that later gives rise to other more characteristic symptoms.

Leaf Trace. Used for vascular strand which is leading from the stele to the leaf in the stem.

Lecanorine. Used for describing a lichen ascocarp in which it is not possible to destinguish ascocarp margins from the rest of the thallus. Such margins are known as *thalline* and consist of both algal and fungal cells. Example is *Lecanora*.

Lecideine. Used for a lichen apothecium, which is dark-coloured or carbonaceous, and generally having no thalline margin.

Lectotype. Used for describing a specimen or other element (description, illustration etc.) which has been selected subsequently from the original material on which the name of taxon was based.

Leghaemoglobin. A protein which is found in the centre of root nodules of Leguminous plants infected with nitrogen fixing bacterium *Rhizobium*.

Legume. (1) A member of the Leguminosae.

(2) A dry fruit which is consisting of 1 carpel, splitting by 2 longitudinal sutures at dehiscence, and having a row of seeds on the inner side of the ventral suture, *e.g.*. a pea-pod.

Lemma. The outer bract of a grass floret, *i.e.*, having the grass floret in its axile.

Lenitic. Used for a freshwater ecosystem having stagnant water *i.e.*, absence of continuous flow of water *e.g.*, lake, pond etc.

Lenticel. A pore in the periderm of a woody stem. It is packed with a loose aggregate of cells derived from the phelloderm, and acts as an organ of gaseous exchange.

Leptoid. An elongated cell used to conduct nutrients in the 'stems' of *Polytrichum* and related bryophytes. It is analogous to a sievė cell of vascular plant.

Leptosporangium. Said of the type of sporangium which is derived from one initial cell completely. It is typical of ferns of order Filicales.

Leptotene. The initial stage of meiosis in which the chromosomes appear longitudinally, single rather than double and the strücture is more definite than in mitosis. There occurs a series of dense chromosomes.

Lethal. Causing death; it is applicable to a normal or abnormal environmental factor, or to a hereditary factor.

Lethal Gene. A dominant or recessive gene, which when substituted for its normal allelomorph is also to convert a viable to an inviable gamete or zygote.

Leucoplast. A starch-storing organelle in the cytoplasm. It is a colourless plastid which is made up of concentric layers of starch around a central body.

Ley. A short-term pasture, sown to last from one to a few years, after which is ploughed-up, and another crop sown.

Liana, Liane. A woody, climbing plant which is found in tropical forests. They usually have anomalous secondary thickening.

Libriform Fibre. An elongated thick-walled element of the xylem which is formed from a single cell.

Lichenes, Lichens. A group of composite plants having an alga and a fungus in intimate association.

Life Cycle. The changes which take place between the production of gametes by one generation, and the production of gametes by the next generation. It may be synonymous with the life-history but may involve a number of individuals, as in the alternation of generations in the bryophytes and pteriodophytes.

Life Form. The form of a plant which is determined by the position of its resting buds (if any), in respect to the surface of the soil.

Ligases. A general term for enzymes for catalysing many biological substances.

Light Seed. A seed which will not germinate unless it gets exposed to light.

Light Stage. The stage in photosynthesis when triosephosphate has been formed from a 3-carbon acid (Phosphoroglyceric acid). The energy absorbed by the chloroplasts splits the water molecule into hydrogen and oxygen.

Lignicole, Lignicolous. Growing on, or in wood, or on trees.

Lignification. The deposition of lignin on and in a cell-wall.

Lignin. A complex carbohydrate which is deposited in the cellulose micella of the cell-walls of woody tissue.

Lignocellulose. A compound of lignin and cellulose occurring in the wood and other fibrous materials.

Ligule. (1) A flattened membrane which arises from the base of the leaves of some lycopods. (2) A membrane at the junction of the leaf-shealth and leaf-base of many grasses.

Limiting. Describing addition of lime to a soil to overcome the soil acidity and improve soil structure or to compensate for calcium deficiency in soil. Quicklime, slaked lime, ground chalk or limestone are used for liming.

Limiting Factor. A factor which stops, or reduces the speed of a reaction, when all other factors are present in abundance.

Limit of Trees. The line, north or south, or upwards on mountains, beyond which trees do not naturally occur.

Limnology. The science dealing with the study of inland aquatic ecosystems.

Linear. Said of leaves that are elongated, much less in breadth and with parallel sides for most of their length e.g., in grasses.

Linkage. When two genes become relatively close together on a chromosome, as not to get separated during cpossing-over in meiosis, *i.e*. they are inherited together, and are said to be linked.

Linkage Group. A group of hereditary characteristics which are associated with one another through a number of generations.

Linkage Map. A chromosome map which is determined by recombination relations.

Linnaean (Linnean) Classification. Said of the system of classification and binomial nomenclature established by Linnaeus.

Linnaean Species. A wide conception of a species, in which many varieties have been included.

Lip. A large projecting lobe of a corolla.

Lipase. An enzyme which breaks down a true fat into its component fatty acid(s) and glycerol.

Lipid (Lipide). An ester which is formed from an alcohol and one or more fatty acids.

Lipopolysaccharide. Any molecule having both lipid and carbohydrate elements; found in cell walls of gram negative bacteria.

Lipo-Protein. Compounds of protein and a fat, which occur most commonly in membranes.

Liposome. A fatty or oily globule in the cytoplasm.

Lithocyst. Said of a cell that contains a cystolith.

Lithophyte. A plant which is growing on rocks and stones.

Lithosere. The type of xerosere developed on rock outcrops or rocky substratum in which pioneer community usually consists of lichens.

Littoral. 1 Describing the seashore between low and high tide marks which continously gets exposed to water and atmosphere and may be muddy, sandy or rocky. Typical plants in this zone are usually algae of order Fucales. 2 Said of the area of lake or pond extending from the edge to the lower limit of rooted aquatic plants. 3. Describing organism naturally living in littoral zone.

Liverworts. Used for bryophytes which belong to class Hepaticae having thallose and leafy liverworts totalling about 1,050 species of 295 genera. Plants are non-vascular, markedly dorsiventral, gametophytes which produce antheridia and archegonia on thallus surface or on fleshy stalks.

Living Fossil. Any present-day species resembling in some characteristics to extinct organisms only. Such species usually occur in relatively unchanging environments and have evolved very slowly. Related species of such organisms occur in abundance in fossil records. For example, living fossils discovered in China are *Ginkgo biloba* and *Metasequoia glyptosstroboides*.

Loam. Said of the soil which have even proportions of sand, silt and clay. It possesses best water holding capacity, soil structure and nutrient availability making it the best soil for cultivation.

Lobe. (1) One of the parts into which a flattened plant member is cut, when the parts are two large and distinct to be called teeth, but not wholly separate from one another.

(2) A portion of a divided (not compound) stigma.

Locule (loculus). Used for describing a cavity in some part of the body of an organism within which specialized structures may develop.

Loculicidal. Said of the dry dehiscent fruit capsule in which wall bursts in the middle of locules and placenta also splits alongwith e.g., cotton.

Locus. (1) The position of a particular gene on its chromosome.

(2) *Hilum* of starch grains.

Lodicule. A scale below the ovary of a grass flower with represents the reduced perianth. There are usually 1 or 2 (rarely). and they get distended with water and assist in the separation of the the glumes.

Loess. A wind-dispersed soil.

Logarithmic Phase. Said of the period during which population growth when number of organisms is increasing at an ever increasing rate of population, increases.

Lomosome. Used for descrbing a complex invagination of the plasma membrane into the cytoplasm. It occurs in some fungal hyphae and spore-producing structures, algal cells and in some cells of higher plants.

Lomentum. Said of a type of dry, schizocarpic fruit which is actually a modification of legume and is developing from monocarpellary superior ovary that has one or more seeds. On maturity, fruit has been divided by development of false/septa into many one-seeded units or valves that fracture into as many mericarps during dehiscence *e.g.* groundnut.

Long-day Plant. A plant that needs more than 12 hours of daylight, followed successively by shorter periods of darkness before it will flower.

Loose Smuts. Said of plant diseases in which spores of casuating fungus produce characteristic uncovered, black, powdery mass of spores on the host *e.g.*, loose smut of wheat by *Ustilago nuda*.

Lophortrichous. Said of a bacterium in which a group of flagella is present at one end of the bacterial cell.

Lotic A fresh water ecosystem in which water flow is continuous *e.g.* a river.

Lumen. A cavity enclosed by a cell wall such as the central space of a xylem vessel.

Luminescence. See bioluminescence.

Lyases. Enzymes which break-down complex molecules to simpler ones, without hydrolysis, *e.g.*, carbonic anhydrase breaks down carbonic acid to water and carbon dioxide,

$$H_2CO_3 \rightarrow H_2O+CO_2.$$

Lysigenic, Lysigenetic, Lysigenous. Said of a space which is formed by the disintegration of cells, especially of secretory cells leaving a cavity containing the secretion.

Lysis. The bursting of a bacterial cell when attacked by a bacteriophage.

Lysogenic Phage. A bacteriophage which does not kill its host.

Lysogeny. Said of breakdown of a bacterial cell infection of a bacetriophage. All RNA viruses and some DNA phages tend to induce lysogeny.

Lysosome. Said of an organelle which is bounded by a single membrane and having hydrolytic enzymes that can degrade cellular components.

Lysozyme. A substance, present in some plants, which has the capacity to kill bacteria. It resembles an enzyme in some respects, but cannot reproduce itself.

Lytic Cycle. Said of the sequence of processes and events taking part in lysogeny. It involves absorption of a phage to a specific on the bacterial wall, followed by penetration and entry of phage into the bacterium, then transcription and translation of phage genetic material within the bacterium and finally lysis of bacterial cell for releasing the newly formed phages.

Lytic 'Phages'. A bacteriophage causing lysis.

M

Maceration. Used for a process in which a specimen is prepared for microscopy by chemical dissolution of the matrix binding parts of the specimen, usually by using strong acids. Isolated portions are then examined or subjected to further processing.

Macrandry. Used for describing the phenomenon where male and female redroductive organs grow on normal sized plants of similar size and structure. Species showing macrandry are termed *macrandrous.*

Macroconidium. (1) A long, or large condium.

(2) The larger, generally more diagnostic conidium of a fungus, which is having microconidia in addition.

Macrocyclic. Used for rusts which have 2 alternative hosts, and all the stages in the life-cycle.

Macrofibrils. Said of fibrils found in the cell wall. These are sometimes large enough to be visible under light microscope and composed of microfibrils which are lying parallel to each other.

Macrofungi. Fungi having large fruit-bodies.

Macrogamete. A large gamete having food reserves, *i.e.* the female gamete.

Macrogametophyte. Used for describing the larger of the gametophytes of the heterosporous pteridophytes. It produces the female gametes.

Macronutrient (essential element). Said of any element which is required by the plant in relatively large amounts for its normal growth. Examples of such elements are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, sulphur, magnesium, calcium and iron.

Macrophyll. *See megaphyll.*

Macrosclereid. Used for describing the relatively short sclerenchyma cell (sclereid), somewhat columnar in shape and forms the outer layer of seed coat in many plants.

Macrosporangium. *See megasporangium.*

Macrosporophyll. *See megasporophyll.*

Major Gene. Said of any gene which is controlling a readily identifiable expression of phenotype. Existence of different alleles of such gene gives rise to qualitatively varying phenotypes in regard to the character governed by the gene. All Mendelian factors constitute examples of major genes. *Compare* polygene.

Malacophylly. Used for the condition in which leaves of the plant are thick, soft and spongy and store water in their water storage tissue *e.g., Begonia, Kalanchoe, Bryophyllum* etc.

Malate Shuttle. Used for the mechanism which is proposed to explain transfer of reducing substance NADPH across membranes of chloroplast. NADPH produced by light reactions in photosynthesis reduces oxaloacetate in chloroplast stroma to malate and this then passes across the membrances to cytosol. In the cytosol, malate is oxidized to oxaloacetate and NADP is again reduced to NADPH. Oxaloacetate again passes back into the chloroplast stroma to start the cycle again.

Male. Used for the organism or the reproductive part which is forming the reproductive apparatus which produces microspores or antherozoids.

Maleic Hydrazide. A growth inhabitor which is usually used as a herbicide or to inhibit sprouting.

Male Sterility. Used for condition in which the production of viable pollens in plant has been prevented by mutation in one or more genes governing their formation. It finds use in plant breeding as a method of ensuring cross pollination and thus forming F_1 hybrids.

Malpighian Cell. One cell of a layer of closely packed, radially directed thick-walled cells occurring in the testas of some seeds.

Maltase. An enzyme which is breaking maltose into its two component glucose molecules.

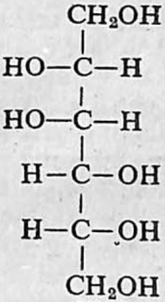
Malthusian Parameter. Used for describing a measure of the relative rate of population increase or decrease when in the appropriate steady state.

Maltose. A disaccharide sugar ($C_{12}H_{22}O_{11}$) which is made up from the condensing of two D-glucose molecules, in the 1 : 4 α-position.

Mangrove. Used for describing association of plants of the muddy swamps at the mouth of rivers and elsewhere in the tropics, over which the tide flows daily, thereby leaving the mud bare at low tide.

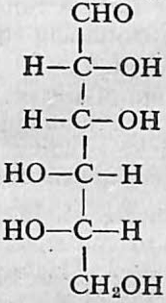
Mannon. A polymer of D-mannose.

Mannitol. A sugar-alcohol of mannose.



D-Mannitol

Mannose. A hexose sugar.



L-Mannose

Mannuronic Acid. Describing a type of uronic acid which occurs in seaweed gum alginic acid. *See also* alginic acid, uronic acid.

Manubrium. Used for describing the tubular structure which arises on the inner walls of antheridium in algae of Charophyta.

Manure. Said of the excreta of animals which is usually mixed with other material especially straw and used to improve soil fertility by adding it to soil.

Maquis. The woodland that is dominated by stunted trees (scrub woodland). It is found in semiarid regions which are deforested for agriculture by fire.

Marginal Effect. Describing the phenomenon of more vigourous growth which is shown by plants growing at the edges of a stand of vegetation than the growth of plants present in the centre of the stand.

Marginal Meristem. Said of the meristematic tissue which is located along the edges of a leaf primordium. Activity of its initials produces mesophyll and epidermal tissues of the lamina.

Marginal Placentation (ventral placentation). Describing the type of placentation in which placentae develop along the ventral suture of a simple, monocarpellary, monolocular ovary *e.g.*, in pods of **Leguminosae.**

Margo. Said of the zone of thickened sexine present around a colpus in a pollen grain.

Marsh. Describing the region of vegetation in which water table is just at the soil surface. The common plants in this region are water lilies reeds, sedges and various types of grasses.

Mass Flow Hypothesis. The theory postulating that there occurs the translocation of sugars from source to sink in the phloem due to continuous flow of water with dissolved sugars. Osmotic pressure at source becomes high due to continuous formation of sugars and it becomes low at the sink due to continuous use of these. Difference in water potentials of source and sink drives continuous water flow.

Massulae. Used for describing the mucilaginous extensions of tapetum which are surrounding microspores and megaspores in water ferns of genus *Azolla*.

Mastigonema. Said of any of the numerous hairlike lateral rodlets which are attached to the main rod in a pleuronematic flagellum. These get arranged in longitudinal rows, oriented at an angle and give flagellum a feathery appearance at high magnification.

Maternal Inheritance. Said of the occurrence of hereditable differences referable to materials transmitted by the egg, but not through the male gamete. This occurs due to ***cytoplasmic inheritance.***

Mating Continuum. An aggregate of individuals whose genes systematically undergo recombination.

Mating Group. A group of individuals, haploid or diploid, within which mating gets favoured at the expense of mating outside the group, by genetic or environmental conditions characteristic of group.

Mating Strain. Said of the group of organisms of a species that are characterized by their failure to interbreed with each other but are able to breed with members of other group of the same species that are morphologically identical but genetically and physiologically different. Both these groups are known as mating strains and usually denoted by symbol+for male and—for female strain. The differences in mating strains are genetically ascertained.

Matric Potential. Generally represented by symbol ψ_m. Defined as the potential expressing absorptive affinity of water to surfaces and colloidal substances due to surface and capillary forces existing in cells, tissues and soil.

Matorral. A xerophilous shrub community which is found on leached acid soils in Spain and Portugal.

Matrix. (1) An outer layer of stainable meterial present in a chromosome.

(2) Any substratum, living or dead, in which a fungus grows.

m-Chromosome. Said of a very small chromosome, many of which may be present in the nuclei of mosses. Their function is not known with certainty.

Meadow. Used for describing a region of moist grassland which could be maintained at the subclimax stage by mowing. Similar areas maintained at subclimax by grazing are known as *pastures*.

Mechanical Tissue. Said of any tissue which is consisting of cells with thickened walls such as collenchyma and sclrenchyma.

Medium. A nutritive substance on, or in which, tissues or cultures of microorganisms may be grown.

Medulla. (1) The central part of an organ, *e g.* the pith of a stem.

(2) A tangle of loose hyphae in a sclerotium, rhizomorph, or any other large fungal structure.

(3) A loose hyphal layer in a thallus of a lichen.

Medullary. Relating to or belonging to the pith.

Medullary Bundle. A vascular bundle which is running in the pith.

Medullary Ray. A sheet of parenchyma that is running radially through the vascular tissue of a stem or root. They are concerned with food storage and lateral conduction of food materials, water etc. They may be primary, or secondary, *i.e.* produced from the cambium, when they are called vascular rays.

Medullary Sheath. The peripheral cells, surrounding the pith. They are smaller cells than those of the pith, and usually have thicker walls and denser contents.

Medullary Spots. Said of the small patches of thick-walled parenchyma in the medulla.

Medullated Protostele. Said of describing protostele in which the central core consists of xylem having mainly tracheids which are interspersed with numerous parenchyma cells thereby resembling the pith (medulla) of a siphonostele. Such steles occur in some primitive ferns *e.g., Gleichenia.*

Megaphyll (macrophyll). Said of the leaf (typically of seed plants and ferns) that is relatively large and usually having leaf gaps associated with leaf traces.

Megasporangiophore. Said of the stalk-like structure bearing megasporangia. The ovule-bearing structures in female cone of cycads are called megasporangiophores.

Megasporangium (macrosporangium). Said of the structure in which megaspores are produced. In seed plants, it corresponds to ovule.

Megaspore (macrospore). Said of the larger of the two types of spores which are produced after meiosis in heterosporous species. It is immobile and contains food reserves for the female gametophyte that develops from it. In angiosperms, four (usually) cells which are formed after meiosis in megaspore mother cell are known as megaspores (though these may be smaller than the microspore).

Megaspore Mother Cell. The diploid cell giving rise to megaspores after meiosis.

Megasporophyll. A leaf bearing megaspores. The leaf can be highly modified, *e.g.* the carpels of a flowering plant.

Meiocyte. Any cell in which meiosis is begun.

Meiophase. The part of a life cycle in which a diploid nucleus undergoes reduction.

Meiosis. Said of the reduction division which is ultimately resulting in the production of gametes. The chromosome number becomes halved by two successive divisions. The nucleus divides twice, but the chromosomes only once.

Meiotic Drive. Said of the process taking place during meiosis in a heterozygote resulting in two kinds of gametes in unequal frequencies.

Meiospore. Any spore formed after first meiotic division in its mother cell. For example, megaspores or microspores in flowering plants.

Membrane. A thin sheet-like structure, usually fibrous which is connecting other structures or liming a part or organ.

Membrane Permeability. Said of the ability of a membrane for allowing passage of substances across it. Membranes in living organisms are differentially permeable.

Membrane Potential. Said of the difference in electrical potentials on opposite surfaces across the thickness of a membrane.

Mendelian Inheritance. Inheritance which is obeying Mendel's laws.

Mendelism. The theory postulating that inheritable characteristics are governed by discrete factors in organism (particulate inheritance) and transmission of characteristics to offspring takes place according to regular and predictable ways as given by Mendel's laws.

Mendel's Laws of Inheritance. (1) The Law of Segregation—that the gametes produced by a hybrid or heterozygote contain unchanged, either one or the other of any two factors determining alternative unit characters in respect of which its parental gametes differed.

(2) The Law of Recombination—that the factors determining different unit characters are recombined at random in the gametes of an individual heterozygous in respect of these factors.

Mericarp. Said of any of the one seeded portions which are separated when a compound fruit undergoes division at maturity. Mericarps may be dehiscent or indehiscent.

Meristele. Any one of a number of amphicribal vascular portions which constitute a dictyostele.

Meristem. Said of a region consisting of actively dividing cells or the cells that have the potential of active division and including initials and their immediate undifferentiated derives.

Meristem Culture (shoot tip culture). Used for describing the culture of excised meristems on suitable nutrient media under aseptic conditions. Often gibberellic acid is added to the medium to promote normal growth of plantlet. Technique is often used for rapid propagation of plantlets, propagation of infertile plants nursery stock or F_1 hybrids that do not breed true. Because most of the viruses do not infect plant apex, this technique is used to produce virus-free stock.

Mesarch. Said of describing maturation of xylem in which older protoxylem cells come in the centre of xylem strand due to both centripetal and centrifugal maturation of newer metaxylem cells.

Mesarch Succession. Said of the succession that occurs in a bare area with mesic condition and results in the development of mesosere which takes part in the stabilization of the area.

Mesic. Said of environmental conditions of a habitant in which water is present in normal amounts for plants and hence the plants in areas are mesophytes of all types.

Mesocarp. Said of the middle layer of the pericarp in an angiospermic fruit, which is situated between exocarp and endocarp. In many types of fruits such as peach, mango etc. mesocarp is fleshy, edible part of the fruit. In some fruits, mesocarp may be absent.

Mesogamy. Describing the type of fertilization in which pollen tube enters ovules and reaches nucellus through sides of ovules (neither from micropylar nor from chalazal end) and then enters embryo sac.

Mesogenous. Said of an angiosperm stomatal complex in which subsidiary cells and guard cells are derived from same initial.

Mesophilic. Said of organisms that require moderate temperatures *i.e*,, 30-40°C for their growth.

Mesophyll. Said of the parenchyma of a leaf which is differentiated into the cylindrical palisade cells with a large number of chloroplasts and arranged with the long axis at right-angles to the epidermis and the spongy mesophyll of loosely packed cells with fewer chloroplasts, and large air-spaces.

Mesophyte. A plant found in places where the water-supply is neither very scanty nor abundant.

Mesophytic Environment. An environment in which the water-supply is neither very scanty nor abundant.

Mesosere. Refers to the set of communities that are formed during mesarch succession in a mesic environment and that take part in stabilisation of the area thereby finally resulting in the establishment of climax in the area.

Mesosome. The structure occurring in bacterial cells by intrusion of plasma membrane into the protoplasm of the cell. Respiratory enzymes are associated with mesosome and it carries out the same function in bacterial cell as the mitochondrion in eukaryotic cells. It is also attached to DNA and controls separation of replicated DNA molecules in cell fission.

Mesozoic. Refers to an era of geological time between about 225 and 65 million years ago. It has been subdivided into Triassic, Jurassic and Cretaceous periods. The period was mainly dominated by seed ferns, cycads, ginkgos, conifers in plants and by reptiles in animals.

Messenger RNA (mRNA). Refers to a linear single, stranded polynucleotide of uridine, adenine, guanidine and cytidine monophosphates. It is synthesized on DNA by mRNA polymerase and sequence of bases in mRNA has been found to be complementary copy of the base sequence in one strand of DNA. This DNA strand is known as *sense strand.*

Mestom Sheath (mestome sheath). Refers to a thin-walled type of bundle sheath present around a vascular bundle. It is found in some grasses.

Metabolic Inhibitor. A substance closely related chemically to the normal metabolite.

Metabolic Nucleus A nucleus when it is not dividing, and when the chromatin is in the form of a net-work.

Metabolism. The net result of the biochemical processes of a living organism, or cells. The balance between anabolism and catabolism.

Metabolite. A substance used during metabolism, *e.g.* oxygen during respiration, or carbon dioxide during photosynthesis.

Metacentric. Refers to a chromosome in which chromatid arms on both sides of centromere are having equal lengths so that centromere appears to be situated in the centre of the chromosome.

Metamitosis. Mitosis in which the nuclear membrane disappears and the karyokinetic figure lies free in the cytoplasm.

Metamorphosis. A change in form or structure, during the development of an individual or species etc.

Metaphase. A stage in mitosis or meiosis when the chromosomes get arranged on equator of the spindle.

Metaphloem. Completely developed primary phloem, which consists of sieve-tubes, fibres and parenchyma.

Metaplasm. Any substance within the body of a cell which is not protoplasm, especially food material.

Metasyndesis. End-to-end union of the elements of a pair of chromosomes.

Metaxylem. Primary xylem derived from the procambium. The cells are heavily lignified, and have reticulate thickening or pitted walls, in consequence, they cannot be stretched.

Micellar Region. An area of crystallinity in a cellulose molecule.

Microbody. A small organelle in cytoplasm which is about 0.5 μ m in diameter and surrounded by a single membrane, having oxidative enzymes. *See* glyoxysome, peroxisome.

Microfibril. A fine thread of cellulose in a cellulose cell-wall.

Microflora. The microscopic plants, *e.g.* fungi and bacteria of an organ or area.

Micronutrient. (trace element). Refers to any of the elements that are needed by a plant in very small quantities for successful normal growth. Examples of micronutrients are heavy metals like copper, zinc, molybdenum, manganese, cobalt etc. Boron, sodium, chlorine, vanadium, silicon are also micronutrients.

Microphyllous. (1) Said of leaves, which are small, with a single central vein, especially of the Pteridophyta.

(2) Said of leaves of xerophytic plants.

Micropyle. (1) A canal into the nucellus which is formed by an upgrowth of the integument(s). It remains as a minute pore in the testa of the seed through which water passes prior to germination.

(2) The opening in the integument of the Lepidocarpales.

Microsere. Said of the set of communities which are during succession in a microhabit at such as small puddle or animal droppings.

Microsome. A minute particle free, or fused, to the endoplasmic reticulum, and containing RNA. They are responsible for metabolism, especially respiration, and protein synthesis.

Microsporangiophore. Said of the stalk-like structure that bears microsporangia.

Microsporangium. A sporangium in which microspores are produced.

Microspore. (1) The smaller of two kinds of spores of heterospores plants, ultimately producing the male gametophyte.

(2) A small spore of a species which produces spores of two sizes.

Microspore Mother Cell. Refers to a cell that undergoes meiosis to form four daughter cells with chromosome number half that of the original cell, each of the daughter cell is developing into a microspore. In flowering plants, pollen mother cells in pollen sacs are regarded as the microspore mother cells.

Microsporocyte. (1) A male gametophyte in the Angiosperms. The pollen mother-cell, which divides to give pollen grains.

(2) A cell which divides to give microspores.

Microsporophyll. A leaf bearing microsrorangia. They may be highly modified, *e.g.*, the stamens of flowering plants.

Microtubules. Used for unbranched tubes which are identified by electron microscopy in the cytoplasm of cells or axoneme fibres of flagella and cilia. Their outer diameter is about 25 nm and the core is apparently hollow, of 4 nm diameter. The wall is composed of protien tubulin which is arranged linearly to from protofilaments. Thirteen protofilaments arranged in a cylinder are forming the wall of each microtubule.

Microtubule Organizing Centre (MTOC), Refers to a general term for kinetosomes, centrioles and other structures which are involved in the formation and organization of microtubules or their derivatives.

Microtome. An instrument for cutting thin sections of specimens.

Middle Lamella. A layer of pectin which is running between adjourning primary cell-walls.

Midrib. The largest vein in a leaf which is running through the middle of the lamella longitudinally.

Mid-Summer Growth. The second period of active growth shown by some trees.

Mildew. (1) A general term for a superficial growth of fungus.

(2) A plant disease caused by a powdery or downy mildew.

Miocene. A geological period, a subdivision of the Tertiary period, from 35-15 million years ago.

Mirror Yeasts (shadow yeasts). Refer to imperfect yeasts of Sporobolomycetales that are imperfect states of basidiomycetes like members of Tramellales. These yeasts undergo reproduction by budding and ballistospores.

Mitochondria. Small bodies present in spaces of the ground cytoplasm. They are spherical, long rods, or threads, and are the sites of many important enzymatic proccess. The innter layer of the wall is infolded into finger-like processes.

Mitosis. The normal process of cell-division in which the chromosomes duplicate themselves into two separate nuclei, and

and ultimately into two new cells. The difference between mitosis and metosis is shown in Fig. 21.

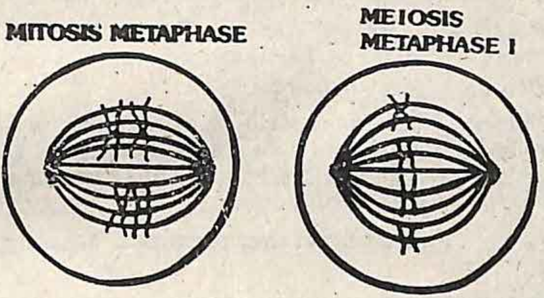


Fig. 21. The basic differences in chromosome behaviour in mitosis and meiosis.

Mitospore. Refers to any spore which is produced as a result of only mitotic divisions in the sporangium and thus having genotype which is identical to the parent from which it is formed.

Mitotic Crossing Over. Used for the process that results in genetic recombination in mitotically dividing cells. It was first observed in *Drosophila* as a rare event.

Mixed Lactic Fermentation. *See heterolactic fermentation.*

Moder. A form of humus formed in conditions of mild temperature and normal pH with normal humidity. This form is some what intermediate between mor and mull humus.

Monoadelphous. Said of stamens that have their filaments fused for the greater part of their length so forming a tube around the style.

Monocarpellary. Said of gynoecium of an angiospermic flower that has one carpel only.

Monocarpic. *See hepaxanthic.*

Monochasial Cyme (Monochasium). Refers to a cymose inflorescene in which only one axillary bud forms lateral branch at each node. The laterals which are arising on alternate sides of the the main axis form *scorpioid monochasium* while laterals which are always arising on the same side form *helicoid monochasium.*

Monoclinous. *See hermaphrodite.*

Monocolpate. Said of a pollen grain that is having one colpus. It is common in most petalloid monocotyledonous species

Monoecious. Refers to an individual in which male and female reproductive organs get separated in different reproductive strtctures *i e.*, in male and female flowers but both type of flowers are present on the same plants.

Monohybrid. Used for individual that is heterozygous in respect of a single factor. It is obtained by crossing two parents that are each homozygous but for different alleles of same factor. For example, when homozygote *TT* is made to cross with homozygote *tt*, an offspring heterozygote monohybrid *Tt* is obtained.

Monolete. Said of a spore having a simple linear scar which is marking the point at which it was joined previously in the tetrad *e.g.*, microspores of members of Isoetales.

Mononucleotide. *See nucleotide.*

Monophyletic. Used for describing phylogentic origin of taxa that are arising from diversification of a single ancestor. In cladistic only those taxa that have all the descendents of a common ancestor are considered as monophyletic.

Monoplanetic. Said of fungi that are producing only one type of planospores.

Monoploid. *See haploid.*

Monopodial Branching. Describing a type of growth where secondary shoots or branches are arising behind the growing point but remaining subsidiary to the main axis whose growth is indefinite. Hence younger shoots remain nearer the stem apex while older ones further away from the apex resulting in a pyramidal growth typical of conifers. Secondary shoots also exhibit same branching pattern on them.

Monosaccharides. Used for describing carbohydrates with empirical formula $(CH_2O)n$, $n=3$-7. In these carbon atoms are arranged usually in unbranched chain with all carbons, except one, being hydroxylated remaining carbon is either ketonic (in ketose sugars) or aldehydic (aldose sugars). All monosaccharides, except dihydroxyacetone, possess *chiral* molecules *i.e.*, exhibiting stereoisomerism. In aqueous solutions they form either pyranose or furanose ring structure in which aldehydic or ketonic carbon is linked with one of the hydroxilated carbons. Isomorphic forms of ring structure of monosacchrides are α or β.

Monosomic. Of an otherwise diploid organim, that lacks one chromosome of its proper complement.

Monosporangium. A sporangium, producing monospores, borne terminally on short lateral branches.

Monospore. A large 4-nucleate aplanospore which is produced by some brown algae.

Monotypic. Said of a species or genus which is exemplified in only one type. ›

Monoxerous. Said of a parasitic fungus which is restricted to one species of host plant.

Monsoon Forest. Said of the type of forest in regions that are having a period of drought and rains (monsoon) alternately. Such forests are present in India, Burma and Indochina.

Moor. Used for describing a region of land in wet, exposed conditions with very slow seepage of water in soil, acid-peaty soil having *Nardus stricta* *Molina caerulea* etc., as common plants.

Mor. Like mull (*q.v.*) but it is practically pure organic matter, more or less compacted and felted together.

Mor Humus. A humus which is developing on acid, sandy heaths. As the soil is too acid for an abundant microflora to live, it means that the humus develops on the surface of the soil.

Morphogenesis. (1) The development of structure or form.

(2) The organization of tissues to form the mature organism.

Morphological Alternation of Generations. The alternation of generations, where the two generations do not look alike.

Morphology. (1) The study of external shape, in contrast to function.

(2) The actual shape of a member.

Mortality (death rate). Used for describing the natural rate of loss of individuals by death in a population. *Minimum mortality* (*specific* or *potential mortality*) means the theoretical minimum rate of loss under ideal conditions and is a constant for a population.

Mosaic. (1) Used for describing the irregular pattern of light and dark-coloured, small green areas on the leaf of a plant due to infection of tobacco mosaic virus.

(2) Refers to the pattern of arrangement of lamina of leaves in the canopy of a plant which makes the maximum utilization of available light by the plant.

Mosses. Used for members of class Musci of Bryophyta. They are the largest and most widely distributed, including about 15,00 species of 610 genera. Gametophytic generation is dominant and exists in two distinct forms, *protonema* which is formed after spore gemination and the other a well developed leafy plant which is developed from buds on protonema.

Mother Cell. Describing a cell that loses its identity after division due to differentiation in its daughter cells *e.g.*, pollen mother cell.

Mould. A fungus which is producing distinct mycelium or spore mass. It is often resembling a velvet-like pad on the host surface. These generally grow on dead and decomposing vegetative matter *e.g.*, *Mucor*.

Mucilage. Used for any substance which swells on absorbing water and gives rise to a slimy solution. These are structurally very complex and generally store water *e.g.*, pentosan mucilage in interior of succulent plants.

Mucronate. A structure which has small, fine point (a *mucro*) arising generally at the tip.

Multch. Used for any organic material which is spread on the ground to suppress annual weeds *e.g.*, peat, leaf mould or shredded bark.

Mull (mild humus). Used for a type of humus which is formed in less acidic or alkaline soils that are rich in calcium and in regions of warm and mildly humid climate having deciduous forest or glassland.

Multiple Alleles. Said of a series of many alleles of particular factor. Naturally occurring multiple allelism is exemplified in incompatibility system of plants.

Multiple Factor Inheritance. Refers to inheritance pattern of characteristic which is governed by polygenes so that the characteristic exhibits a range of approximately continuous variation in phenotypic expression from one to another extreme *e.g.*, size of beans, ear-length in maize, etc.

Multiple Fruit (composite fruit). A fleshy fruit developing from a complete inflorescence. Coenocarpium, sorosis, syconus etc. are multiple fruits.

Multivalant. The group of more than two homologues which are formed during meiosis in polyploids or polysomics.

Muricate. A structure having its surface covered by sharp points or prickles or hard, short proiections.

Mushroom. Used for the fruiting body or sporophore of fungi of Agaricales which is umbrella-like in shape. It is composed of pseudoparenchyma of hyphae and is differentiated into a stalk (stipe) and a pileus at its top.

Muskeg. A peat bog characteristically found in northern coniferous forests of North America. Common plants are pitcher plants, sundews, black spruce etc.

Mutagen. Describing any agent causing increase in the frequency of mutation. It may be a chemical reacting with nucleotides (*e.g.*, nitrous acid, proflavin), short-wave radiations (*e g.*, ultravoilet, X-ray and cosmic rays), ionizing radiations (*e g.*, α-and β-rays) or base analogues incorporated in place of normal bases during DNA synthesis.

Mutation. Said of any sudden, inheritable change in genotype that is not taking place as as a result of recombination and does not exist previously in the parents.

Mutation Theory. Theory proposed by Hugo-de-Vries in 1903 postulating that evolution takes place by natural selection operating on spontaneous mutations in a population.

Muton. Used for the gene which is defined as a unit of mutation *i.e.*, the portion of inheritable material involving in mutation. Such a gene may be a single nucleotide only because any change in even one nucleotide will cause change in the whole sequence of bases coding for any protein and shall ultimately express as a mutuation.

Mutualism. Used for the biotic interaction which is taking place between two or more organisms and in which all the interacting partners get benefitted by the interaction and neither of them gets harmed. Symbiotic relationship mycorrhizal association etc., are examples.

Mycelia Sterilia. Used for the order Agonomycetales of Hyphomycetes. It is including about 200 species of 26 genera, the members of which are imperfect mycelial fungi and do not produce spores although some are developing sclerotia *e.g.*, *Rhizoctonia*, certain species of which are possible for damping off disease and *Sclerotium*.

Mycelium. Said of the mass of branching, more or less loosely interwoven hyphae that make up the vegetative plant body of most fungi.

Mycobiont. Used for the fungal partner in a lichen which is making up most of the body of lichen. It is generally a member of Ascomycetes especially of class Discomycetes though members of other groups *e.g.*, Basidiomycetes are also mycobiont in some lichens. *Compare* phycobiont.

Mycology The science of fungi.

Mycorrhiza. Said of a symbiotic association which is taking place between a fungus and the roots of a plant. It is usually necessary for normal and proper growth of the plant.

Mycotrophic Said of a symbiotic relationship between a fungus and whole body of a plant. It occurs by spread of mycorrhizal fungus to the aerial parts of plant as in certain feathers and orchids.

Myrmecochory. Said of the distribution of seeds or other reproductive structures by ants as in *Halleborus* species.

Myrmecophily. Said of the condition of an organism that is living with a colony of ants. It is usually seen in animals but some flowering plants are also having specialized inflated organs to house ant colony *e.g.*, thorn providing shelter to ants and extrafloral nectaries for their use in various species of tropical American *Acacia*.

Myxamoeba. A swarn cell (*See* swarm cell) which has lost flagella and may increase by division before it acts as gamete.

N

N. The haploid, or gametic number of chromosomes.

NAA (naphthalene acetic acid). Said of a synthetic auxin which is very useful in stimulating rooting in cuttings and promoting flowering.

NAD (nicotinamide adenine dinucleotide, coenzyme I). A pyridine based nucleotide which acts as a coenzyme in many oxidation-reduction reactions, mainly acting as electron acceptor in oxidation reactions. General oxidation-reduction reaction is ;

NAD+reduced substrate=NADH+H^++oxidized substrate. Reduced NAD may act as reducing agent or may get reoxidized through respiratory chain with coupled ATP production.

NAD is not tightly binding to the enzyme but binding to it only at the time of action, thereby acting as conezyme. It is generally associated with catabolic processes. NAD has trivial name of diphosphopyridine nucleotide (DPN).

NADP (nicotinamide adenine dinucleotide phosphate, coenzyme II) : A pyridine-based nucleotide which acts as coenzyme to several oxidoreductase enzymes. It is usually associated with anabolic reactions and acting as an electron donor in enzymatic reduction reactions. Its trivial name is triphosphopyridine nucleotide (TPN).

Nanandry. Used for condition in ceratin species whose male individuals are considerably smaller than the females e.g., in some species of green alga *Oedogonium*. The species showing nanandry are *nanandrous*.

Nastic Movement. A response to a stimulus which is independent of its direction, *e.g.* opening of buds under different light intensities.

Natality (birth rate). Said of the natural rate of addition of new individuals to the population. *Maximum* (*absolute, potential, phiysiological*) *natality* may be defined as the theoretical maximum production of new individuals under ideal conditions and is constant for a population. *Ecological* (*realized*) *natality* may be defined as the actual population increase under actually existing situations of habitat that the population is occupying.

Natural Classification. Describing any classification of oranisms having high level of predictability. It is based on very broad base of studies of cytogenetics, microanatomy, phytochemistry in addition to morphology, anatomy and geography.

Naturalized. Introduced from another region, reproducing freely by seed and maintaining its position in competition with indigenous plants.

Natural Order. Used for historical category which is more or less equivalent to modern family. 56 natural orders had been listed by Linnaeus in 1764. However, according to International Rules of Nomenclature, it is not possible to use natural orders in place of families though many correspond very closely to modern families.

Natural Selection. The mechanism of evolution which was propounded by Darwin (1859). Within a population, individuals vary slightly. Certain variations are more favoured by the environment, and consequently survive, and reproduce, thereby propagating the variation.

Neck. (1) The upper tubular part on an archegonium, and of a perianth.

(2) The lower part of the capsule of a moss, just above the junction with the seta.

Neck Canal Cell, Neck Cell. One of the central cells of the central canal in the neck of an archegonium.

Neck Initial. A cell which is derived from a jacket-cell of the bryophyte and pteridophyte archegonium. It ultimately divides to form the neck of the archegogium.

Necrogenic Abortion. The speedy death of the tissues of a plant just under the point of attack by a parasite, thus checking the spread of the latter.

Necrosis. Death of a cell or group of cells, while still part of the living plant.

Nectar. (1) A sugar fluid which is produced in the nectaries of of some insect-pollinated flowers.

(2) A similar solution produced by fungi, to attract insects to disperse spores.

Nectar Guide : *See* honey guides.

Nectary. A gland in some flowers, or other part of the plant, which is secreting nectar.

Neo-Darwinism. Used for describing the expanded and modified version of Darwin's theory of evolution in terms of genetic and molecular biology. Collection of all such studies into a coherent evolutionary theory is known as *modern synthesis*.

Neoteny. Used for describing to phenomenon of arrested development of all cells in an organism except the cells in germ line. It results in an organism that is sexually mature but otherwise is having juvenile characteristic.

Neotype. Said of the plant specimen which is selected to act as standard taxonomic reference after irretrievable loss of all type material of the taxon.

Neritic. Living in the sea at a depth of less than 200 m.

Nerve. The midrib, or large vein in a leaf.

Nervicolous. Said of a parasitic fungus which lives on the veins of leaves.

Net Assimilation Rate. The rate of increase in dry weight per unit area of a leaf. This is approximately equivalent to the rate of photosynthesis.

Net Primary Production. Referring to the total amount of energy (in the form of bond energy of organic food material) which is made available in unit time by producers in an escosystem to all the consumers of that ecosystem for their use.

Net Production. Referring to the total amount of energy made available in the form of food by a trophic level to its next higher trophic level (s) in unit time. This term is used for trophic levels except the producers.

Neutral Theory of Molecular Evolution. A theory postulating that there occurs random drift of selectively equivalent mutant genes as the cause of evolutionary change at the molecular level rather than the process of natural selection.

Neuromotor Apparatus. An organelle which is found in the motile cells. It is probably including gametes and zoospores, of the Chlorophyta. It is intimately associated with the nucleus, and is responsible for the production of flagella.

Neuter. (1) Apparently sexless, especially of strains of fungi which usually show sexuality.

(2) Of flowers in which the androecium and gynoecium are functionless or absent.

Neutral Spore. An asexual spore produced by some algae. They are produced in various ways, but are never in sporangia.

Niche. A term used for describing the status of a plant or animal in its community, *i.e.* its biotic and trophic relationship.

***nif*-Genes.** Said of the genes governing fixation of atmospheric nitrogen in certain microorganisms, particularly the bacteria.

Night Break Effect. Used for the phenomenon of interference in normal flowering rhythm by permitting light artificially during night even for a very short duration or in low intensity. The effect is exhibited by many plants.

Night Temperature. Said of temperature which is prevailing around an organism during the period of darkness. In many plants, it greatly affects the growth. Low night temperatures are assumed to lower the respiration.

Nitrification. The oxidtion of nitrogen-containing ions in the soil, by bacteria, *e.g. Nitromonas* oxidizes ammonium ions to nitrites and *Nitrobacter* oxidizes nitrites to nitrates.

Nitrogenase. Said of an enzyme system which is isolated from certain bacteria and is responsible for fixation of atmospheric-nitrogen. In the presence of ATP and suitable electron donor, it reduces molecular nitrogen to ammonia.

Nitrogen Cycle. The circulation of nitrogen in Nature. Dead organic matter is converted to ammonium compounds during decay in the soil. These are converted to nitrates (see *nitrification*), which are utilized again by plants. Some of the nitrates are converted to gaseous nitrogen by the denitrifying bacteria, but this loss has been counterbalanced by the fixation of nitrogen by *Bacillus radicicola* and the tissue of legume root-nodules in which it grow.

Nitrogenfixation. The conversion of atmospheric nitrogen into organic nitrogen compounds. This is carried out by some soil bacteria, or by others living in the nodules on the roots of various plants, *e.g.* leguminous plants.

Nitrophilous. Said of plants characteristic of places having a high concentration of nitrogen compounds.

Node. (1) The part of stem where the leaf or leaves emerge. (2) The zone on the thallus of the Charales, which gives rise to the lateral branches and the cortex.

Nomenclatural Type. Used for describing single element e.g., illustration. description, specimen etc. on which description associated with the original publication of a name was based. Type of a taxon may be a holotype, lectotype or neotype.

Non-Conjunction. The complete failure of synapsis.

Non Disjunction. Describing the phenomenon of failure of paired homologues to separate during anaphase I of meiosis. This results in two gametes that are having both homologues and other two gametes that lack that chromosome. Such gametes are aneuploids.

Non-Persistent. Used for describing the pesticides that break down and become inactive quite quickly e.g., natural insecticides derris and pyrethrum.

Nonsense Codon. Said of the name which was given originally to three triplet codons UAG, UGA and UGG which are not coding for any aminoacid but are acting as signals to stop transcription of mRNA. Two codons AUG and GUG that code for valine or methionine also act as signal to start transcription.

Northern Coniferous Forest (boreal forest or taiga): Type of cold forest that is having relatively few types of trees, mainly fir, pine and spruce, with some deciduous trees like birches and larches. Conifers in these forests well adapt to long, cold winter sand retain leaves by taking advantage of short growing season. Boreal forests occur in North America and northern Eurasia.

Nu-Body: *See nucleosome.*

Nucellus. The central tissue of the ovule having the embryo-sac and surrounded by the integument(s).

Nuclear Budding. The production of two daughter-nuclei of unequal size by constriction of the parent nucleus.

Nuclear Cap. Of the Blastocladiaceae, a body at one side of the nucleus of a zoospore or gamete.

Nuclear Fragmentation. Said of formation of two or more portions from a nucleus by direct break-up, and not by mitosis.

Nuclear Genes. Genes occurring in the nucleus, in contrast to plasmagenes.

Nuclear Membrane. A layer which is bounding the nucleus. It consists of two layers (each about 75-100A° thick) bounding a cisterna-like space, and the outer one being continuous with the endoplasmic reticulum. It is perforated by round holes (200-500A° in diameter) called nuclear pores.

Nuclear Plate. The aggregation of chromosomes in the equitorial plane during mitosis or meiosis.

Nuclear Reticulum. A mesh-work of delicate threads of chromatin which is seen in stained preparations of metabolic nuclei.

Nuclear Sap. The fluid lost by the chromosomes as they contract during prophase, and which fills the space of the nucleus.

Nuclear Spindle. Said of the fusiform structure, composed of fine fibrils arranged longitudinally and converging at the poles, which appears in the cytoplasm of a cell surrounding the nucleus during mitosis and meiosis.

Nucleic Acids. The non-protein constituents of nucleo-proteins. They have a high molecular weight, and consist of alternate units of phosphate and a pentose sugar, which has a purine and pyrimidine base attached to it.

Nucleohistone. Said of a complex of polynucleotides of DNA and histone proteins that are occurring only in nuclei of eukaryotic organisms and visible as nucleosmoes.

Nucleolar Organizer. Said of region of chromosomal DNA coding for ribosomal RNA and identified as secondary constrictions (except centromere which is primary constriction) which are often located towards the end of chromosome.

Nucleolus. A body, not having desoxyribose nucleotides and secreted by a specific organizer, gene or super-gene, in the resting nucleus.

Nucleoplasm. The ground-substance of the nucleus. It may appear granular or fibrils.

Nucleoprotein. A protein which is combind with, or combinable with, a nucleic acid.

Nucleoside. A chemical group which is consisting of a purine or pyrimidine base, and a pentose sugar.

Nucleosome (nu body). Said of a nodule which is about 7-10 nm in diameter. It consists of histones around which a DNA strand, about 120 base pair long, is wrapped in the chromosomes. A type of histone, H_1 is situated between adjacent nucleosomes and may lamp the DNA in position.

Nucleoside Diphosphate Sugars (NDP-sugars). Describing any of the compounds formed by reacting phosphorylated hexose sugar with a nucleoside triphosphate (NTP) by involving the general reaction :

NTP+sugar I-phosphate=NDP−sugar+pyrophosphate.

Nucleotide. Said of any base-phosphate complex having 3 essential parts ; a purine or pyrimidine base linked to carbon-1 of a pentose sugar (ribose or deoxyribose) which in turn gets esterified on carbon-5 to phosphoric acid. Polymers of nucleotides are known as *polynucleotides* which again are of two types ; RNA (containing ribose sugar and bases uracil, adenine, guanine and cytosine) and DNA (having deoxyribose sugar and bases adenine, guanine, cytosine and thymine).

Nucleus. Said of cell organelle in eukaryotic cell which has genetic material (in chromatin) and nucleoplasm surrounded by a nuclear membrane.

Nullisomic. The zygote which is formed by fusion of gametes that both lack same chromosome and nullisomics are usually inviable.

Numerical Hybrid. A hybrid whose parental gametes are different in respect of the number of chromosomes.

Numerical Mutation. A change in the number of chromosomes, either balanced to give polyploidy, or unbalanced to give aneuploidy.

Nurse Cell, Nurse Tissue. (1) Any cell or tissue in contact with developing gametes, and concerned with their nutrition.

(2) In *Scleroderma*, hyphae giving food material to spores which have become detached from the basidia.

Nut. A hard, dry usually one-seeded indehiscent fruit, which is derived from a syncarpous ovary.

Nutation. (1) The spiral growth of the apex of a plant organ, e.g. shoots, tendrils, etc. It is caused by variation in the rate of growth of the meristematic areas.

(2) The lateral swaying of the tip of a growing organ.

Nutrient Medium : *See culture medium.*

Nyctinasty. Describing a nastic movement where part (s), especially leaf and flower take a characteristic position in the night. These *sleeping movements* often cause folding together of leaflets.

O

Obdiplostemonous. Having two whorls of stamens, the members of the outer whorl are being placed opposite the petals, and not alternating with them.

Obligate. Compelled; can live only under one type of circumstance.

Obligate Parasite. A parasite which is not capable of a free existence.

Obligate Saprophyte. A saprophyte, that is living on dead material, and incapable of attacking living tissue.

Oblique Division. The development of a septum which is neither parallel to the long axis of the cell, nor across it at right-angles.

Obscure. Said of a vennation which is poorly developed, so that hardly more than the mid-rib can be seen.

Obtuse. Used for a leaf apex that is blunt or rounded in shape.

Occasional Species. A species found from time to time in a given plant community, but not a regular member of that community.

Ochrea, Ocrea. A cup-shaped structure around a stem which is formed from united stipules or united leaf-bases.

Ochrea. Said of the tube which is formed by sheathing stipules at leaf base that surrounds the stem. Ochreas are characteristic of Polygonaceae.

Oedogonium. Stages of cell division in Oedogonium are shown in Fig. 22.

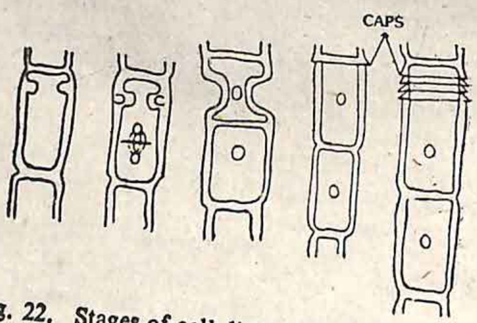


Fig. 22. Stages of cell division in Oedogonium

Offset. Used for a short shoot which is arising from an axillary bud near the base of stem and producing a daughter plant at its apex for vegetative propagation e.g., in *Sempervivum tectorum*.

Oidium (=**Argthrospore**.) (1) A spore which is formed simultaneously throughout the length of a filament.

(2) Spermatia formed on hyphal branches, especially in heterothallic Hymenomycetes.

(3) Flat-ended asexual spores which are formed by the breaking of hyphae.

Oil. A fat which is liquid at normal atmospheric temperature. Essential oils have relatively low molecular weights, and are volatile, many having a strong perfume.

Oil Body. A large single droplet of oil present in isolated cells of some of the liverworts, especially the Marchantiaceae.

Oil Drop. Any small droplet of oily material which is included in the cytoplasm.

Oidium (**arthrospore**). Said of a spore-like structure which is formed by organized fragmentation of a hypha e.g., in *Endomyces* that forms a new hypha asexually.

Oil. Said of any triglyceride that is liquid at room temperatures. It is usually having unsaturated oleic and linolenic acids as major fatty acids.

Oil Gland. Said of a gland that secretes an essential oil.

Oligocene. Used for describing an epoch of tertiary period of Cenozoic era from 36 million to 25 million years ago during which oceans got contracted and mountain ranges were formed and climate remained relatively warmer with dominance of tropical forests and flowering plants and monocotyledonous plants were evolved.

Oligosaccharide. Said of any carbohydrate which is having 2-10 polymerized monosaccharide units. It is mostly having two (disaccharides), three (trisaccharides) or four(tetrasaccharides) sugar units. These may act as intermediates in polysaccharide metabolism or may serve as storage products.

Oligotrophic. Describing an area that is poor in minerals and bases. This term is usually applied to ponds and lakes having low nutrient levels but also to bog peats..

One Gene : One Enzyme Hypothesis: According to this theory every enzyme is coded by a particular gene. An evidence in favour of this theory comes from the fact that presence or absence of an enzyme in a biochemical pathway is a genetically determined characteristic inherited as a single gene.

Ontology. Used for the changes which are taking place during the life history of an organism.

Oogamy. Said of the fertilization of a large non-motile female gamete by a small, motile male gamete.

Oogenesis. The development of an egg from an oocyte.

Oogonium. A cell which is giving-rise to oocytes, directly or by mitosis.

Oolysis. The conversion into leafy structures of carpels and ovules.

Oophyte. A gametophyte in the Bryophyta and Pteridophyta.

Ooplasm. The central plasma in the Oogonium of some Oomycetes, representing a more or less undifferentiated egg.

Oosphere. (1) The large non-motile fertile gamete of some algae and fungi.

(2) An ovum.

Oospore. The thick-walled resting zygote which is formed from a fertilized oosphere.

Operational Taxonomic Units (OTUs). Said of the entities whose affinities have been studied by numerical taxonomy. Depending on the level and type of investigation, an OTU may be of any taxonomic rank.

Operator Gene. Said of a site on DNA adjacent to a structural gene which is acting as a 'switch' starting or 'stopping' transcription from structural gene.

Operculum : 1. A cap covering the ostiole in certain ascomycete fungi. 2. A lid which is covering the aperture in many pollen grains which gets pushed aside by the emerging pollen tube. 3. The membranous cap which is covering the peristome in the capsule of many moss sporophytes before dehiscence of the capsule.

Operon. Used for describing a group of genes which are lying adjacent to each other and function as a single unit (either all transcribing together or none doing so) and code for a set of enzymes in a particular pathway.

Opposite. (1) Inserted at the same level.

(2) Said of leaves that are inserted in pairs at each node, with one on each side of the stem.

(3) Said of a stamen which lies next to the middle of a petal.

Orbicular. Said of the structure where shape is almost circular and flattened e.g., leaves of *Nymphoides pletata*.

Order. Describing a major category in taxonomic hierarchy which is usually comprising of families.

Ordination. Said of a technique which is used by ecologists following the continuum concept of community in community ecology for relating the composition of different stands of vegetation to each other. Certain properties of each stand are made to plot against one or more axes, where each axis is representing some enviromental gradient. Thus it gives an arrangement in which different stands are ordered in the manner that best reflects their similarities and dissimilarities.

Ordovician. Used for describing the second period of Palaeozoic era, about 500-440 million years ago when temperature was quite high, even at poles and most of the earth was covered by seas. There was no terrestrial life and the only dominant plants were marine algae.

Organ Culture. Said of culture of excised organs e.g., roots, leaves, embryos, meristems etc., in a suitable aseptic medium.

Organelle. Used for describing any of the membrane-bound structures which are present in the cytoplasm of a cell. It is for carrying out a specific metabolic process essential to the life of cell e.g: mitochondrion, chloroplast etc.

Organogenesis. said of developmental changes that take place during formation of a particular organ.

Origin of life. Describing the way in which living organisms have originated on earth. It is accepted that life has originated about 3000-3500 millon years ago from inorganic matter. Probably long-chained protein and carbohydrate molecules were formed from simple molecules by catalytic reaction.

Orinthophily. Used for pollination in which pollens are being carried by birds. It is important in many tropical species.

Orthotropism. Used for the type of tropism in which growth response is directly towards or away from the source of stimulus e.g., vertical growth of stem is described as negative orthotropism.

Orthotropous. (1) Used for an ovule which is straight, *i.e.* with the micropyle in a straight line with the funicle.

(2) Used for an organ which shows a sharp positive or negative tropism in respect to a given stimulus.

Osmosis. The phenomenon of the passage of water(or solvent) rom a dilute solution to a more concentrated one through a semi-permeable membrane.

Osmotic Potential. (solute potential); Symbol ψ_p. said of the decrease in water potential of a solution in water which occurs due to dissolved ionic or non-ionic solute particle in it or the decrease in chemical potential of solvent in a solution which occurs due to presence of ionic or non-ionic solute particles. It depends on the number of particles rather than their nature or charge. It is generally expressed in bars with negative sign.

Osmotic Pressure. The pressure which is developed due to the passage of water by osmosis. The maximum osmotic pressure of a given solution is developed when it is separated from pure water by a semi-permeable membrane.

Ostiole. (1) A general term for an opening.

(2) The opening by means of which spores etc. escape from a conceptacle or a perithecium.

Outbreeding. The mating of relatively unrelated gametes.

Outer Fissue. The upper arm of the cleft in the raphe (wall) of some Bacillariophyceae.

Ovary. The hollow basal region of a carpel, having one or more ovules. In a flower with 2 or more united carpels, they form a single compound ovary. (2) Loosely used as meaning the pistil.

Ovate. Flat and thin which is sphaped like the longitudinal section of an egg, widest below the middle.

Ovule. (1) The nucellus having the embryo-sac and is enclosed by 1 or 2 integuments, which after fertilization, and subsequent development, becomes a seed. Types of ovule orientation are shown in Fig. 23.

(2) A young seed in the course of development.

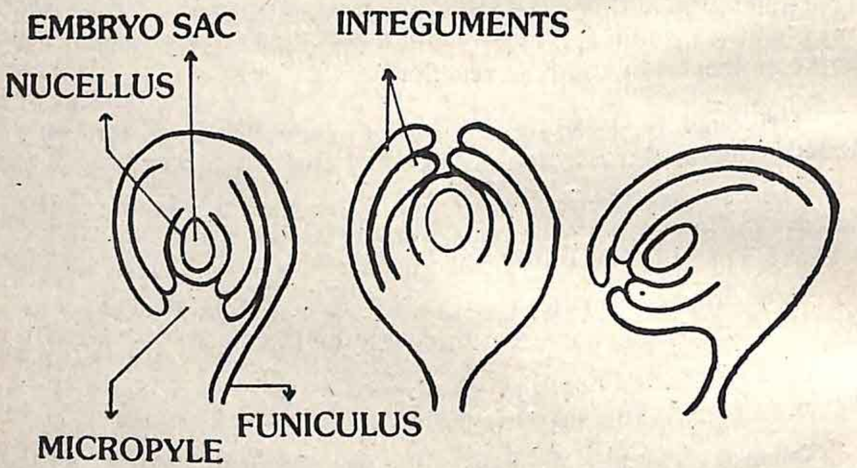


Fig. 23. Types of ovule orientation.

Ovule Culture. Said of the culture of excised ovules on suitable media in vitro for purpose of study or plant propagation.

Ovuliferous Scale. One of the scales of a fertile cone, in the Coniferae it bears ovules and later seeds.

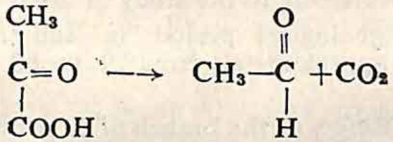
Ovum. A non-motile female gamete.

Oxaloacetic Acid. $COOH.CH_2CO.COOH$. It is formed in the citric acid cycle and glyoxylic cycle, from malic acid, and produces citric acid.

Oxidase. An enzyme which brings about the oxidation of a substrate. Several enzymes may take part in oxidizing a substrate to its final form.

β-Oxidation. An oxidation taking place between No. 2 and No. 3 carbon atoms to form a double bond.

Oxidative Decarboxylation. Oxidation by the removal of carbon dioxide, *e.g.*



$$\begin{matrix} CH_3 \\ | \\ C{=}O \\ | \\ COOH \end{matrix} \longrightarrow CH_3{-}\overset{\overset{O}{\|}}{\underset{\underset{H}{|}}{C}} + CO_2$$

Pyruvic acid

Oxidative Phosphorylation. The formation of ATP from DPNH and oxygen, or TPNH and oxygen.

Oxidoreductases. A group of enzymes catalysing oxidations and reductions.

Oxychromatin. A form of chromatin staining comparatively lightly, and has little nucleic acid.

Oxygen Debt. Oxygen consumed in excess of normal amounts, or when an organism, or part of an organism, is respiring with an inadequate oxygen supply.

Oxygenotoxis, Oxytaxis, Oxygenotactic, Oxytactic. A response or reaction of an organism which takes place to the stimulus of oxygen.

P

P. Refers to the parental generation from which a breeding experiment starts. All the female and male parents are each uniform as regards the allelomorphs under observation.

P_{680}. A special form of chlorophyll-a which is having light absorption peak at 684 nm. It is one of the constituents of photosystem II of photosynthesis.

P_{700} : A special form of chlorophyll-a which is having light absorption peak at 700 nm and is found in photosystem I of photosynthesis.

Pachytene. Used for the double thread. By extension, the third stage in meiotic prophase when the chromosomes pair, *i.e.* form a double thread.

Packing Cell. An individual parenchymatous cell.

Paedomorphosis : *See neoteny.*

Pairing. Used for chromosomes. It becomes active when they come together at zygotene, and passive when they stay together during the first metaphase.

Palaeobotany. Referring to the study of fossil plants.

Palaeocene. A geological period (a sub-division of the Tertiary) which lasted approximately from 70 to 60 million years ago.

Palaeoecology. Refers to the branch of palaeobotany that is dealing with the study of fossils with a view to establish ecology and environmental conditions of past geological ages.

Palaeoethnobotany. Refers to the science dealing with the study of fruits and seeds found in archeological sites.

Palaeozoic. Used for describing era of geological time before mesozoic and following Proterozoic era about 225 million years ago during which there occurred the formation of large mountain ranges and primaeval sea spread on earth to a very large extent.

Palea. Used for describing the upper of the pair of bracts that lies beneath each floret in grass inflorescence. It is usually thin, narrow with its sides almost parallel to each other.

Palindrome. Refers to often few hundred base pair long sequence in DNA. They are scattered throughout the chromosomes and palindromic *i.e.*, reading same both ways. Their function is not certain.

Palisade cell. (1) A single cell of a palisade layer.

(2) One of the terminal cells of the hyphae forming the cortex of a lichen thallus.

Palisade Layer. A layer of elongated cells which is set at right-angles to the surface of a leaf or thallus, and is underlying the upper epidermis, or layers of cells. Its cells have numerous chloroplasts and is concerned with photosynthesis.

Palisade Mesophyll. Used for photosynthetic chlorenchyma which is composed of more or less elongated cells arranged in radial columns that forms part of the ground tissue of leaves alongwith spongy mesophyll.

Palisade Stereide. A rod-shaped cell occurring in the testa of a seed. It is thick-walled, elongated, and lies at right-angles to the surface of the seed.

Palisade Tissue. one or more layers of palisade cells beneath the epidermis of a leaf.

Palmate. Having several (5-7) lobes, segments etc. spreading from the same point, like the fingers of a hand. The term is especially applicable to leaves.

Palmelloid. A multicellular growth form in which body of organism is composed of a large number of loosely aggregated cells which are held together in a mucilaginous matrix. Such forms are characteristic of certain blue-green algae.

Palynology : Study of fossil spores, pollens and similar structures.

Pampas. A term for South American grassland.

Pangenesis. Refers to the theory which postulated that the heredity of organisms is determined by the summation of influences from an indefinite number of particles (pangenes) derived from all parts of the body-tissues and variably affected by variation in the environment.

Panicle (1) A branched raceme, in which each branch is bearing a raceme of flowers.

(2) More generally any branched inflorescence which is in any way complex.

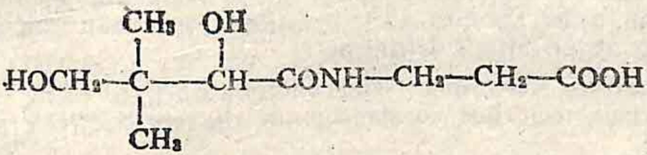
Panmixis. Said of the unrestricted random crossing, which is probably quite rare but may be applicable to crossing that appears random with respect to a particular character.

Pancolpate. A pollen that is having many colpi.

Panphotometric. Said of a narrow leaf which stands nearly or quite.

Pantonematic Flagellum. A flagellum which has mastigonemes on both sides of the main axis

Pantothenic Acid. A part of co-enzyme, A, and one of the B group of vitamins. It is essential for the growth of yeasts and some bacteria.



$$\mathrm{HOCH_2{-}\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}{-}\overset{\overset{OH}{|}}{CH}{-}CONH{-}CH_2{-}CH_2{-}COOH}$$

Papain. A enzyme (or group of enzymes) occurring in paw-paw leaves. In neutral solution, it hydrolyses protein to polypeptides.

Papilla. Refers to a projection from a cell, usually from epidermal cell. It is usually regarded as a kind of trichome, often swollen and covered with wax and in xerophytes serves as protection from strong sunlight and water loss.

Pappus. A ring of fine, sometimes feathery, hairs, developed from the calyx, and covering the fruit (usually of the Compositae). It acts as a parachute, and helps in wind-dispersal.

Parachute Disseminule. A fruit or seed having hairs, or some other mechanism which helps in dispersal by wind.

Paraflagellar Body. Said of the light-sensitive structure which is visible as a swelling on the flagellum of some members of Euglenophyta.

Parallel Evolution (parallelism). Refers to the evolution of similar adaptations in related organisms taking place due to being subjected to similar selection pressure even when distributed in wdely separated regions.

Parallelodromous. Said of the form of leaf venation in which two or more primary veins are originally at the base of lamina and running to the apex in an essentially parallel manner as in many monocotyledonous leaves. The usual term for such venation is *parallel*.

Paramylum. A polysaccharide forming in both green and colourless algae of Euglenophyta as storage product.

Paraphyletic. Said of a group of organisms that are not all descendents of a common ancestor.

Paraphyll, Paraphylum. A leaf-like, or filamentous appendage near a 'leaf' in mosses.

Paraphysis. A sterile hair which is growing around, or among reproductive structures and is found in some algae, ascomycetes, basidiomycetes, and mosses.

Paraphysoid. A plate of cells occurring between the asci in ascomycetes.

Paraplasm. Said of the inactive vegetative part of the protoplasm.

Parasexual Recombination. Said of the type of recombination which is occurring in progeny of certain heterokaryotic fungi in which meiotic segregation does not take place. The sequence of events involved is called *parasexual cycle*.

Parasite. A plant or animal that is living on, or in another organism, called the host. The parasite extracts food from the host, and lives at the latter's detriment.

Parasitic Castration. The condition when a plant is unable to produce fruit due to damage to the reproductive organs by a parasite.

Parasitism. Said of the temporary or permanent relationship existing between two different organisms in which one organism is benefitted and is called *parasite* while other partner is harmed and is called *host.*

Parasporangium. A sporangium having paraspores.

Parasore. A spore which is produced on the tetrasoprophyte of some Rhodophyta. It is very likely to be diploid, and always germinates to produce a new tetrasporophyte.

Parastichy. A spiral line which is passing once around a stem through the bases of successive leaves.

Parasymbiosis. Refers to the condition when two organisms grow together without assisting or harming one another

Parasynapsis, Parasyndesis. Said of the side-by-side association of a pair of chromosomes as in zygotene and pachytene.

Parathecium. A layer of hyphae present around the apothecium of a lichen or Discomycete.

Paratonic. Said of a plant movement which is induced by external stimulus.

Parenchyma. Refers to a tissue of undifferentiated cells, which are more or less spherical, frequently unspecialized, and with cellulose cell-walls. Air-spaces are often present, and the tissue is often for storage.

Parichnos. In certain lower vascular plants, a pair of scars, one on each side of the leaf base ; each scar is marking the end of a strand of parenchyma which is passing into the stem.

Parietal Placentation. Refers to a type of placentation in which placentae are developed along the fused margins of carpels in a unilocular, compound ovary.

Paripinnate. Said of a pinnate leaf in which all the leaflets are paired as in *Vicia.*

Parthenoapogamy. The fusion of vegetative nuclei.

Parthenocarpy. The development of a fruit without involving the formation of seeds as a result of (*a*) lack of pollination, (*b*) lack of fertilization, (*c*) lack of embryo development. The condition can be artificially induced by application of hormones.

Parthenogamy. The union of two female gametes, or the structures equivalent to them.

Parthenogenesis. Said of the development of an egg cell into embryo without involving fertilization, usually due to defective meiosis that results in egg nucleus having unreduced number of chromosomes *e.g.*, in *Taraxacum.* In some species *e.g.*, *Hieracium*, any cell of nucellus other than the megaspore may be involved in parthenogenesis.

Parthenospore (azygospore). A thick-walled resting spore produced from unfertilized female gamete by involving parthenogesis in certain algae *e.g.*, *Protosiphon* and fungi *e.g.*, *Entomophthora muscae*.

Partial Dominance. *See incomplete dominance.*

Partial Habitat. The habitat occupied by a plant during one stage of its life-cycle.

Partial Parasite. A plant having at least some power of photosynthesis, but obtaining some material salts and water, from a host.

Partial Umbel. One of the smaller groups of flowers which altogether make-up a compound umbel.

Partial Veil. Used for agarics, a layer of tissue joining the pileus edge to the stipe during the development of the hymenium. It may later form the annulus or cortina.

Particulate Inheritance. Inheritance, in one individual, of distinctive characteristics from both parents.

Partspore. One of the one-called spores resulting from the breaking up of a two-or-more-celled ascospore.

Passage Cell. An unthickened cell in the endodermis of a root which is found opposite the protoxylem element, through which solutions can diffuse in a transverse direction.

Pasture. *See meadow.*

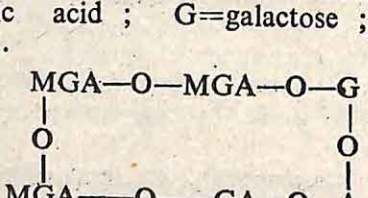
Pathogen. Refers to any agent that causes a disease in a living organism when present in association with it internally or externally. Term is usually limited to disease causing organisms like fungi, bacteria and protozoa etc.

Pathogenicity. *See virulence.*

Patristic. Refers to the condition of similarity existing between two or more taxa which is due to their common ancestry. The concept of such relationships is purely phylogenetic and does not associtate with construction of phylogenetic classifications.

Peat. Refers to the accumulation of partly decomposed plant matter, due to the lack of oxygen, *i e.* waterlogging, not allowing the bacteria that bring about decomposition, to live.

Pectic Compounds. Refer to the polysaccharides which are present in the cell-walls of unlignified tissue. They are soluble in water,. and form gels under certain conditions. A=arabinose ; GA=galacturonic acid ; G=galactose ; MGA=Methylated galacturonic acid.



Pectic Sheath. A lager of pectose which is formed on the outside of the cellulose cell-wall of the Chlorophyta.

Pectin. Refers to the structural polysaccharide in plant cell walls which are rich in α (1-4) linked galactouronic acid residues though other sugars e.g. rhamnose may also be present.

Pectinase. An enzyme which is destroying the pectin of the middle lamella of cell-walls. It is produced by many parasitic fungi.

Pectinate. Comb-like.

Ped. Refers to the large aggregates of soil particles that are bound by sticky and glutinous organic matter. Peds are important in making and maintaining a particular soil structure and making soil more fertile.

Pedalfer. A soil which is developed under humid conditions. There occurs no accumulation of calcium carbonate, but the clay complex is differentiated (or tends to differentiate) into horizons, there by resulting in the accumulation of sesquioxides.

Pedate Leaf. A palmately divided compound leaf which is having three main divisions, and having the outer divisions one or more times.

Pedafid. Having the lamina which is deeply cut in a pedate manner.

Pedicel. (1) The stalk of an individual flower of an inflorescence.

(2) A small stalk.

Pedicel Cell. A large basi-central cell present in the globute of the Charales. It bears all the other structures of the globule, which have been derived by division of a cell at its apex.

Pedicellate. (1) Said of a flower or a fruit which is having a stalk.

(2) Having a stalk.

Pedigree. A table of ancestry or of posterity.

Pedigree Method. Refers to a technique in plant breeding which is used to produce entirely new varieties of plants incorporating the best qualities of all selected existing varieties. This method is limited to self-pollinated species.

Pedocals. A group of soils, usually associated with drier climates, and having a freely drained profile with a horizon of calcium carbonate.

Pedogamy. Pseudomixis between mature and immature cells, as in certain yeasts.

Pedogenesis. Reproduction in young or immature organisms.

Pedogenic Factor. The factors affecting the final appearance of a soil profile, *i.e.* parent material, climatic factors, topography, vegetation. and time.

Pedology. Refers to the study of the structure, properties and development of soil body.

Peduncle. Refers to the main axis of inflorescence on which flowers are borne. *See also* pedicel.

Peg. An outgrowth from the hypocotyl of seedings of some Cucurbitaceae. It assists the seeding to emerge from the testa.

Pellicle. (1) Refers to the outer layer of the upper surface of a pileus, when it can be stripped off as a delicate membrane.

(2) Of bacteria, a growth on the surface of a liquid culture.

Pelagic. Refers to the organism living in upper layers of water in a sea or ocean such as plankton.

Pellicle (periplast). Refers to a membrane surrounding the protoplast in some unicellular algae that does not have cell wall e.g., *Euglena.*

Pellucid. Refers to anything that is transparent.

Peltate. Refers to a structure which is circular in shape and having a stalk in its centre e.g., leaf of *Trapaeolum majas* or sporangiophore in *Equisetum.*

Penetrance. Used for describing the proportion of individuals homozygous for a particular gene which show the phenotype for that gene. Penetrance of many genes is practically 100% but in other cases it is much less, the value being affected by the environment or geneotype.

Penicillic Acid. An antibiotic which is produced by *Penicillium puberlum*, and *P. cyclopium.*

Penicillin. An antibiotic which is produced by strains of *Penicillium notatum*, and *P. chrysagenum.*

Penicilliopsin. A yellow pigment which is produced by *Penicilliopsis clavariiformis.*

Pentamerous. Refers to a flower in which number of units in each whorl is five or its multiple. It occurs in dicotyledonous plants.

Pentosans. Said of any polysaccharide which is having pentoses as the major constituent subunits. Most common monosaccharides occurring in pentosans are xylose and L-arabinose.

Pentose. Refers to any of the 5-carbon sugars e.g., ribose, deoxyribose, xylose and arabinose that are synthesized from hexoses in pentose phosphate pathway, from CO_2 in Calvin cycle or by decarboxylation of nucleic diphosphate sugars.

Pentose Phosphate Pathway (phosphogluconate pathway, hexose monophosphate shunt). Represents a multifunctional pathway in which there occurs oxidation of glucose and formation of 3-, 4-, 5-, 6- 7- carbon sugars. Glucose 6-phosphate is oxidized and decarboxylated to yield a 5-carbon sugar with formation of NADPH. This sugar now undergoes various combinations and transformations thereby resulting in the reformation of glucose 6-phosphate.

Pentoxylales. An order of extinct gymnosperms from Jurassic having uncertain affinities.

PEP (phosphoenolpyruvate). Refers to the phosphorylated intermediate of glucose metabolism. In glycolysis, it is the precursor of pyruvic acid while in synthesis of glucose from acetyl CoA, PEP is formed from oxaloacetate produced in glyoxylate cycle. In C_4 plants, it acts as an intermediate in Hatch-Slack pathway.

Pepo. A fleshy or succulent fruit, often of large size which is formed from an inferior syncarpous ovary, and having many seeds. It is a particular type of berry, *e.g.* a cucumber.

Peptidase. Said of any hydrolase enzyme catalysing hydrolysis of peptides. *Exopeptidases* attack terminal peptide bonds, *endopeptidases* attack bonds within the peptide chains.

Peptide. Refers to any molecule having a number of amino acids which are linked covalantly by peptide linkages.

Peptide Linkage. The bond between two amino acids in which the amino (NH_2) group of one is joining with the carboxyl (COOH) group of the next to give a —NH—CO—linkage between them, with the elimination of water.

Perennation. The survival from season to season, generally with a period of reduced activity between each season.

Perennial. A plant that is living for three or more seasons, and normally flowering and fruiting at least in the second and subsequent seasons.

Perfect. (1) Said of a flower which is having both functional anthers and ovules.

(2) Said of the stage in the life-cycle of a fungus which produces spores by sexual fusion.

Perfoliate. Said of a leaf base surrounding a stem completely so that the latter appears to pass through it.

Perforation Plate. Refers to the remains of the end walls between two adjacent vessel elements in a xylem vessel which form an opening between two vessel elements. Such plates occur in some ferns, some gymnosperms (Gnetales) and most angiosperms.

Perianth. (1) The floral envelop, it includes the calyx and corolla, or any one of them.

(2) The cup-shaped or tubular sheath which is surrounding the archegonia of some liverworts.

Periblem. The tissue at the growing point of a stem or root which is lying between the dermatogen and plerome. It gives rise to the cortex.

Pericarp. (1) A layer of vegetative tissue which is covering a fruit-body, as in some fungi.

(2) The body of a fruit developed from the ovary-wall, and enclosing the seeds

Pericentral Cell. A cell which is cut off in a radial plane and is found in the thalli of some Rhodophyta.

Perichaetial Bract. One of the 'leaves' composing the perichaetium in a moss.

Perichaetium. (1) A cup-like sheath which is surrounding the archegonia in some liverworts.

(2) The group of 'leaves' which are surrounding the sex-organs of some mosses. They are closely, and somewhat different in structure from the normal 'leaves'.

Perichylous. Having water-storage tissue which is surrounding the chlorophyll-containing tissue.

Periclinal. (1) Used for the cell-walls which are running parallel to the surface of the plant.

(2) Curved in the direction of, or parallel to the surface of a plant member.

Periclinal Chimaera. A chimaera in which the distinct tissues have been arranged concentrically.

Pericycle. A cylinder of vascular tissue which is 3-6 cells thick and lying immediately inside the endodermis of a root. It consists of parenchyma, and sometimes fibres.

Periderm. A secondary protective tissue which is formed in secondarily thickened stems and roots. It consists of the phellogen (cork cambium), phellem (cork), and phelloderm (secondary cortex).

Peridermium. A form of aecium having the peridium irregularly split or broken.

Peridinales. Refers to an order of the Dinophyceae. The walls are composed of a definite number of plates that are arranged in a specific manner. The entire wall is never vertically separated into two halves or valves.

Peridinin. An alcohol-soluble, reddish pigment present in the chromatophores of the Dinophyceae.

Peridium. Used for the outer wall of the fruit-body of a fungus, when it is constructed of sterile tissue, and organized as a distinct layer.

Perigamium. Part of a reduced branchlet which is having the archegonia of some mosses.

Perigenous. Refers to the stomatal complex of angiosperms in which subsidiary cells and guard cells are not derived from the same initial.

Perigonium. A group of 'leaves' which are often forming a flat rosette around the base of the group of antheridia in mosses.

Perigynum. (1) The 'leaves' which are surrounding the archegonia in mosses.

(2) A tubular sheath surrounding the archegonia in liverworts.

Perigynous. Used for a flower in which the receptacle is developed into a flange or concave structure, on which the speals, petals, and stamens are borne. The receptacle is distinct from the carpels.

Perinuclear Cisterna. *See nuclear membrane.*

Periplasmodium. Used for the fluid formed by breakdown of tapetum in some plants that is absorbed by developing microspores.

Periplast. *See pellicle.*

Perisperm. A nutritive tissue which is present in some seeds and derived from the nucellus ot the ovule.

Perispore. The remains of the contents of the cells of the tapetum, forming a deposit on the outside of the walls of the spores of ferns

Peristome. (1) A fringe of elongated teeth presented around the mouth of the capsule of a moss. The teeth are formed from the persistent remains of unevenly thickened cell-walls.

(2) A fringe of hyphae present around the opening of the fruit-body of some Gasteromycetes.

(3) A form of lip which is arising as an outgrowth in some Protophyta. It assists in the ingesting of solid food.

Peristromium. The bounding membrane of a chloroplast.

Perithecium. Refers to the rounded, or flask-shaped fruit-body of certain ascomycetes and lichens.

Peritrichous, Peritrichiate. Used for bactaria when there are flagella distributed over the whole surface of the cell.

Permanent Collenchyma. Functional collenchyma occurring in the stems and petioles of herbaceous plants.

Permanent Hybrid. A hybrid which breeds true because some types of possible offspring are prevented from developing by the operation of lethal factors.

Permanent Quadrat. *See quadrat.*

Permanent Wilting Point. Refers to the point at which amount of water in the soil becomes so low that plants start showing permanent wilting. At this point, water potential of soil becomes equal to or lower than that of the plant.

Permeability. The extent to which molecules of a given kind can pass through a membrane.

Permease. A possible enzyme responsible for the translocation of ions(s) across a membrane.

Permian. A geological period which was lasting approximately from 220 until 190 million years ago.

Permo-Triassic. Refers to a period that encompases both Permian and Triassic. It is regarded as a single period as no sharp boundry exists between rocks of two periods due to conditions prevailing during these periods. Earth movements were intense, mountains were built, volcanic activity took place resulting in extinction of many groups of organisms and appearance of new forms.

Peroxidase. An enzyme catalysing the oxidation of a substrate by the removal of hydrogen. The hydrogen is removed by its combination with hydrogen peroxide.

Peroxisomes. Said of a microbody that is having amino acid oxidases, urate oxidases and catalase.

Persistent Perianth. A perianth which remains unwithered, and often enlarged around the fruit.

Pest. Refers to any organism that damages and reduces the yield of crop or irritates or injures livestock. This term is restricted to animals causing physical damage *e.g.*, locusts.

Pesticide. Any chemical used to kill and destroy pests such as insecticide, fungicide or herbicide.

Petal. Refers to an individual unit of corolla in angiospermic flower.

Petalody. Said of transformation of reproductive organs, stamens and carpels, into petals as taking place in double flower and flore pleno.

Petiole. Refers to the stalk that attaches the lamina of leaf to the stem with its base strengthened by widening (leaf base).

Pfitzer's Law. That cells become progressively smaller during successive generations.

Pfluger's Rule. The mitotic figure elongates in the direction of least resistance.

***Pfr*.** Refers to the active form of plant pigment phytochrome which possesses light absorption peak in far-red region of spectrum at about 725-730 nm. It changes to P*r* reversibly and gets associated with many light mediated plant responses.

Phage. *See bacteriophage.*

Phagocytosis. Means endocytosis which is exhibited by certain unicellular holozoic algae. In the algae protrusions of outer regions of cell formed by following movements of cytoplasm, surround the food particle, enclose it by a membrane-bound *food vacuole* and then lysosomes become associated with food vacuole. The intervening membrane breaks down and food particle gets digested by hydrolytic enzymes.

Phanerantherous. Said of the statmens that are exerted in the flower.

Phanerogam. Refers to the plant in earlier classifications in which reproductive organs are easily visible as flowers or cones.

Phanerophyte. Refers to plant with perennating buds situated well above the ground level supported on the stem and buds are potentially exposed to environment. Such plants are found in temperate, moist region and include trees, shrubs, herbs succulents and vines. On the basis of the height of plant, these have been classified as *megaphanerophytes* (over 30 m), *mesophanerophytes* (8-30 m), *microphynerophytes* (2-8 m), an *nanophanerophytes* (below 2).

Phellem. Cork. Suberized cells which are formed in the outside regions of a stem or root, from a phellogen.

Phelloderm. A cylinder of unthickened cells formed from a phellogen on the inner side. The cells often have starch, and sometimes chloroplosts. It is a kind of secondary cortex.

Phellogen. The cork cambium. A layer of meristematic cells lying in the cortex of a stem or root. It forms cork on its outer surface, and phelloderm on the inside.

Phellandrene. A terpene which is found in *Eucalyptus* spp.

Phelloid. A crust of non-suberized, or slightly suberized cells on the surface of some plants, replacing true cork.

Phenetic. Refers to the relationships between two organisms or group of organisms that are assumed on the basis of overall similarities and differences. A phenetic clasification considers as many characteristic as possible.

Phenocopy. The phenotype of a given genotype which is changed by external conditions to resemble the phenotype of a different genotype.

Phenogram. Refers to a type of dendrogram that represents the degree of phenetic similarity. It is based solely on phenetic data.

Phenology. The study of periodical phenomena in plants, *e.g.*, the time of flowering in relation to climate.

Phenon. Refers to a cluster of groups in a phenogram that are showing phentice similarities and phenons may be assigned rank in accordance to the level on the phenogram at which they branch off. Thus the clusters above 80% phenon line could be assigned the rank of genus while rank of subfamily may be assigned the rank of clusters above 55% line.

Phenon Lines. Refers to lines which are drawn at right angles to the phenogram. They show values of similarities as percentage. Greater value shows higher level of similarity.

Phenotype. The kind or type of organism that is produced by the reaction of a given genotype with the environment.

Phenotypic. Caused or produced by envirenmental factors.

Phenoxyacetic Acids. Refer to a group of compounds some of which exhibit auxin-like activity. The substances have been found to be immune to plant's endogenous IAA oxidixing system and some such chlorine substituted forms find use as selective weed-killers. Examples are 2, 4-D ; 2, 4, 5-T and MCPA.

Phialaspore. Said of a type of conidium which is formed in many Eurotiales and Hypocreales. It is developing at the tip of specialized finger-like cells called *phialides*.

Phloem. Refers to the vascular tissue which conducts synthesized foods in vascular plants. It is characterized by the presence of sieve-tubes, and in some plants companion cells, fibres and parenchyma.

Phleom Fibre. An element of sclerencyma (or a strand of such elements) which is present in the phloem. It helps to support the sieve tubes.

Phloem Island. A patch of phloem which is surrounded by secondary wood.

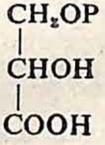
Phloem Parenchyma. The unspecialized cells which are found in the phloem.

Phloem Ray. The part of a vascular ray that passes through the phloem.

Phosphogluconate Pathway. *See pentose phosphate pathway.*

Phosphoenolpyruvic Acid. A carbon dioxide acceptor during photosynthesis, which results in the production of pyruvic acid and phosphate.

Phosphoglyceric Acid (PGA). The product obtained from ribulosediphosphate by reacting with carbon dioxide during the dark phase of photosynthesis. It is then reduced by $NADH_2$. It is also an intermediate product in the anaerobic respiration of hexosediphosphate to pruvic acid.



$$\begin{array}{c} CH_2OP \\ | \\ CHOH \\ | \\ COOH \end{array}$$

Phosphoglyceride (phospholipid, phosphatide, glycerophosphatide). Refers to any of a group of complex lipids which are similar to acylglycerides except that third hydroxyl group gets phosphosrylated *e.g.*, phosphatidylcholine, phosphatidyl-ethanolamine and phosphaticylinositol (all in seed tissues) and phosphatidylglycerol occurred in leaves.

Phospholipid. *See phosphoglyceride.*

Phosphorylase. *See kinase.*

Phosphotransferase. *See kinase.*

Photic Zone. Said of the zone of surface water in oceans, lakes, ponds etc. where light penetrates and plankton is found.

Photoautotroph. An autotroph utilising the energy of radiation (solar radiation in nature) for synthesizing organic food materials from inorganic substances. Examples of photoautotrophs are green photosynthetic plants, animals or bacteria.

Photoheterotroph. Used for photosynthetic organism that needs a supply of organic compounds as a source of hydrogen *e.g.*, purple non-sulphur bacteria.

Photoblastic. Used for seeds that need particular conditions of light and dark for their germination.

Photolysis of Water. Refers to the splitting of water molecule into molecular oxygen and reducing equivalents in light reactions of photosynthesis taking place in plants. Oxygen is evolved as gas whereas electron and proton components of water, by evolving photosystems I and II ultimately reduce NADP to NADPH.

Photomorphosis. A change taking place in the structure of a plant after exposure to strong light.

Photon. -Refers to 'packet' of light energy. It may be regarded as a particle of mass $h\nu/c^2$, where h is Planck's constant, ν the frequency of vibration, and c the velocity of light.

Photonasty. Response to a general, non-directional illumination stimulus, *e.g.*, the opening and closing of flowers at night.

Photoperiodism. Refers to the effect of the length of alternating light and dark periods on the growth and formation of flowers and fruits. Most plants possess their optimum day-length for flower formation.

Photophile. Refers to a phase during which flowering gets promoted by light.

Photophobe (skotophile). Used for describing phase during which flowering is inhibited by light and promoted by darkness.

Photophosphorylation. The formation of ADP and ATP in the presence of inorganic phosphate during the light-phase of photosynthesis.

Photoreceptor. Any region of a plant which is sensitive to light *e.g.*, paraflagellar body of some members of Euglenophyta.

Photorespiration. Used for describing that component of respiration in plants that take place only in light. It does not take place in mitochondria and is not coupled to oxidative phosphorylation. It is about 3-5 times faster in C_3 plants than in C_4 plants where it is hardly detectable. As no ATP is formed in it, it is a wasteful process and photosynthetic efficiency gets increased by about 50% in C_3 plants by its inhibition.

Photosynthesis. Refers to the sequence of events taking place in green plants and photosynthetic bacteria in which light energy of solar radition gets trapped and converted into chemical energy of bonds in complex organic carbohydrates that are synthesized by involving inorganic substances like CO_2 and water and concomitant release of oxygen. Overall reaction may be put as follows :

$$6\ CO_2+6\ H_2O+\text{light energy} \rightarrow C_6H_{12}O_6+6\ O_2$$

Photosynthetic Bacteria. A group of phototropic bacteria having a green pigment, bacteriochlorophyll, which is similar to chlorophyll and thus it can photosynthesize organic food involving light energy but derives hydrogen from H_2S or other reduced sulphur compounds instead of water. CO_2 fixation occurs by involving Calvin cycle reactions. Green sulphur bacteria, purple sulphur bacteria and purple non-sulphur bacteria are the examples of photosynthetic bacteria.

Photosynthetic Capacity. Said of the efficiency of a plant cell or a chloroplast in carrying out photosynthesis.

Photosynthetic Efficiency. Refers to the ratio of light-energy absorbed by the chloroplasts of a tissue in unit time, to the amount of energy fixed per unit time.

Photosynthetic Number. Defined as the ratio between the number of grams of carbon dioxide absorbed per hour by a unit of a leaf to the number of grams of chlorophyll which that unit has.

Photosynthetic Quotient, Photosynthetic Ratio. Defined as the ratio between the volume of carbon dioxide absorbed to the volume of oxygen set free, during a given time, by plant material occupied in photosynthesis.

Photosynthetic Unit. The minimum unit of chlorophyll which is necessary to reduce 1 molecule of carbon dioxide, *e.g.* it is estimated that 2,500 chlorophyll molecules are necessary.

Photosystem I & II (pigment system I and II, PS I and PS II). Refers to two photochemical systems which consist of photosynthetic and accessory pigments and electron carriers that work in sequence to carry out non-cyclic and cyclic photophosphorylation and NADPH formation sequences of light reactions during photosynthesis. These systems occur in chloroplast grana and are linked to each other. PS II has form P_{680} of chlorophyll-a that is having light absorption peak at 684 nm.

PS I has form P_{700} of chlorophyll-a that is having light absorption peak at 700 nm.

Phototaxis. Taking place of the movement of a whole organism in response to light.

Phototonus. The condition of a leaf which is able to respond to a stimulus, because it has received an adequate amount of light.

Phototroph. Refers to an organism that obtains energy required for the synthesis of organic compounds directly from solar radiation *e.g.*, photoautotroph, photoheterotroph etc.

Phototropic Conduction. The differential conduction of auxin down either side of a shoot which is unilaterally illuminated, so that growth occurs towards the light.

Phototropic Induction. The effect of light on the apex of the plant affects the growth of the stem below it, *i e.* the tip, under the influence of light, induces growth lower down.

Phototropism. The growth curvature of part of a plant in response to light.

Phragmobasidium. A basidium which becomes septate, and is then divided into four cells.

Phycobilin (biloprotein). Refers to any of the blue or red accessory, photosynthetic pigments which occur in blue-green and red algae. These are different from chlorophylls and carotenoids in being water soluble but are structurally very similar to porphyrin part of chlorophyll molecule except that magnesium is not present in them.

Phycobilisome. Said of a small particle which is about 30 nm in diameter ; many such particles are present on the membranes of lamellar system of blue-green algae.

Phycobiont. Refers to an algal partner in a lichen that is often a member of genus *Trebouxia*. If a blue-green algae (e.g., *Nostoc*, *Rivularia* etc.) is present, the lichen is generally gelatinous. 24 genera of algae are so far found in lichens.

Phycocyanin. The blue pigment present in the chloroplasts of the Rhodophyta, and distributed through the cells of the Cyanophyta.

Phycoerythin. The red pigment of the Rhodophyta. It occurs in the cell-sap, and is protein in nature and soluble in water.

Phycology. The study of Algae.

Phycopyrrin. A red-brown water-soluble pigment in the Chromatophores of the Dinophyceae.

Phyletic. *See phylogenetic.*

Phyletic Classification. A scheme of plant-classification which is based on the presumed evoluntionary descent of organisms.

Phyllid. Used for describing leaf-like structure in mosses and leafy liver-worts.

Phylloclade. Describing a modification of stem where a portion of stem having few internodes and nodes becomes flattend and leaf-like and takes up the function of leaf. The leaves in such plants are reduced into spines, protuberances etc. and are present on the phylloclade also.

Phyllody. Refers to the transformation of parts of flower into leaf-like structures. It may take place in response to some infections as in maize infected with *Sphacelotheca reiliana* which develops phyllody in both male and female flowers.

Phyllotaxis (phyllotaxy). Refers to the arrangement of leaves on the stem. Various types are shown in Fig. 25.

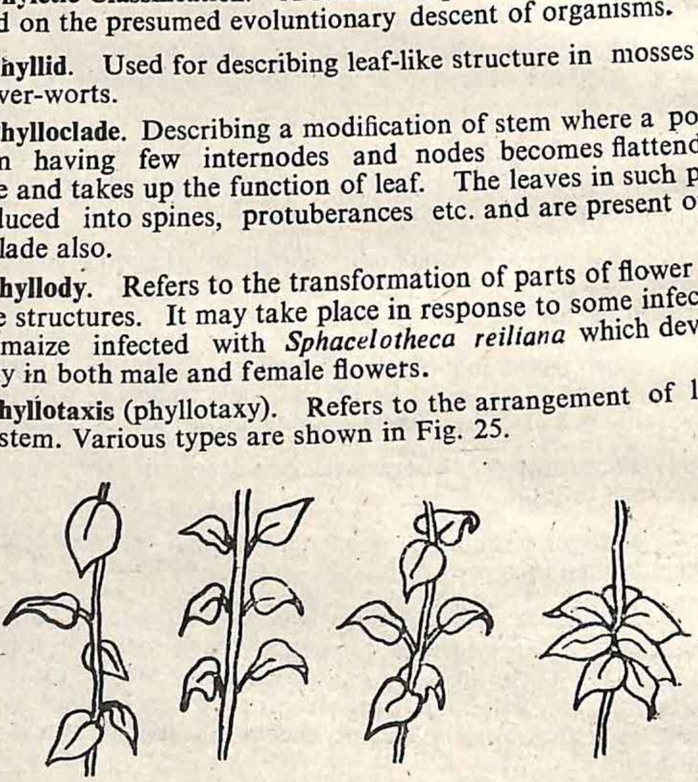


Fig. 24. Types of phyllotaxis

Phylogenetic (phyletic). Used for the study of stages in the evolutionary history of groups of organisms. This study is carried out on the basis of fossil studies, comparative anatomy etc. and such study forms a basis for classification. In such classification, more weight is given to characters that are assumed to be the result of evolutionary relationships

Phylogeny. Said of the evolutionary history of an organism or a group.

Phylum. A major division of the plant or animal kingdom. The term 'division' is used more frequently in the plant kingdom.

Physiographic Factor. Refers to any of the factors besides the climatic, edaphic and biotic factors that influences the prevailing conditions within a habitat and distribution of living organisms in it. These include such factors that are due to topography, altitude, drainage conditions, degree of erosion, slope of land etc.

Physiological Balance. The balance between the ions in a culture solution, so that none of them can have an adverse effect on the growth of a plant.

Physical Barrier. Any physical object, *e.g*. a sea or mountain range which imposes a barrier on the migration of plants or animals.

Physiognomy. The characteristic appearance of a plant community by which it becomes possible to be recognized at a distance.

Physiographic Climax. A plant community which is maintained in a certain stage of development by some natural. features of the habitat.

Physiological. Relating to the functions of a plant (or animal) as a living organism.

Physiological Anatomy. The study of the relation between structure and function.

Physiological Drought. Refers to the condition when a plant failes to take in water, because of the low ground-temperature, or because it holds substances in solution which hinder the absorption of water by the plant.

Physiological Race (forma specialls). Said of a population that is morphologically identical but physiolouically different from other populations of the same species. Such races exhibit genetic diversity of the species.

Physiology. The study of the physical and chemical processes which go on in living organisms.

Phytoalexin. A chemical produced by a host that is inhibiting the growth of a pathogenic fungus e.g., phenolic compound pisatin accumulating in pea tissues in presence of various fungi.

Phytochrome. A protein pigment that takes part in physiological responses to light in plants e.g., photoperiodism light stimulated germination and removal of etiolation symptoms. It is known in two forms *Pfr* and *Pr*. The two are interconvertible by absorbing appropriate wavelength of light. Interconversion also takes place in darkness and is inhibited by low temperatgre. *Pfr* may also be lost by decay.

Phytoferritin. Refers to an iron-protein complex that appears as electron opaque aggregation of particles in chloroplast stroma (even without osmium fixation). It may be regular and crystalline or a loose cluster. It is an iron-containing protein around which proteinaceous shell has been arranged.

Phytogeography (plant geography). Refers to the study of geographical distribution of plants and their interrelationships with one another and with the environment.

Phytohormone. A substance which is produced by plants (or manufactured) that influences the growth and/or development of all or part of the plant.

Phytopathology. The study of plant diseases, especially of plant in relation to parasites.

Phytotron. A large group of experimental buildings maintained at a variety of controlled conditions for research on plants.

Pigment. Describing any coloured compound of charactetistic colour due to its capacity for absorbing certain wavelengths only e.g., chlorophylls, carotenoids, cytochromes etc.

Pigment System I and II :*See photosystem I and II.*

Pileus. The cap of an agaric which is bearing the hymenium on its lower surface.

Piliferous. (1) Ending in a delicate hair-like point.

(2) Bearing hairs.

Piliferous Layer. The part of a root epidermis bearing the root-hairs.

Pilose. A structure having long, soft hairs,

Pilus (fimbria). Refers to a tube-like projection from a bacterial cell. It is finer than a flagellum and is having a hollow core.

Pin. *See* heterostyly.

Pinna. (1) The secondary division of a compound fern-leaf.

(2) A branch of a thallus, when they are arranged in opposite rows.

Pinna Bar. A plate-like vascular stand which is formed by the fusion of two pinna traces.

Pinnate. (1) A compound leaf having leaflets arranged in two ranks on opposite sides of the rachis.

(2) A thallus having branches arranged on each side of a middle axis.

Pinnatifid. A leaf-blade which is cut about half-way towards the mid-rib, into a number of pinnately arranged lobes.

Pinna Trace. The strand of vascular tissue which is running from the main vascular tissue of the rachis to that of a pinna.

Pinnule. (1) One of the lobes or segments when the leaflet of a pinnate leaf is itself divided in a pinnate manner.

(2) One of the fine terminal branches of the Bryopsidaceae. They may break off and serve for vegetative reproduction.

Pinocytosis. The formation of a small vacuole or vesicle in the cytoplasm.

Pinocytotic Vesicle. *See pinocytosis.*

Pioneer Community. The first plant community that is becoming prominent on a piece of formerly bare ground.

Pioneer Species. A species whose members tend to be among the first to occupy bare ground.

Piperidine Alkaloids. A group of alkaloids whose structure is based on piperidine ring. Most are derived from amino acid lysine e.g., nicotine.

Pistil. (1) Each separate carpel of an apocarpous gynoecium.

(2) The gynoecium as a whole, whether it is apocarpous or syncarpous.

Pistillar. Club-shaped.

Pistillate. A flower which has carpels but no anthers.

Pit. (1) Refers to a small sharply-defined area of a plant cell-wall which remains unthickened when the rest of the wall gets thickened.

(2) The two opposite thin areas in the walls of two cells or vessels in contact.

(3) A local thin spot in the wall of the oogonium of some Oomycetes.

Pit Cavity. Refers to the excavation in a cell-wall where the thinning is apparent.

Pitcher. An urn-shaped or vase-shaped modification of a leaf or part of a leaf. It serves to trap insects or other small animals which are killed or digested.

Pith. A cylinder of cell which is chiefly parenchymatous and lying centrally in an axis surrounded by vascular tissue.

Pitted Thickening. Refers to the type of secondary wall patterning in tracheary elements in which continuity of secondary cell wall has been broken only by pits and perforation plates (if present).

Placenta. (1) The part of an ovary to which the seeds get attached.

(2) Any mass of tissue to which sporangia or spores get attached.

Placental Cell. A food-supplying cell for the developing carposporophyte or some red algae.

Placentation. Refers to the arrangement of the placentas in a syncarpous ovary.

(*a*) *parietal*—the carpels are fused only by their margins so that the placentas then appear as internal ridged on the ovary wall.

(*b*) *axile*—the margins of the carpel fold inwards fusing together in the centre of the ovary, forming a single central placenta.

(*c*) *free central*—the placenta is a central upgrowth from the base of the ovary.

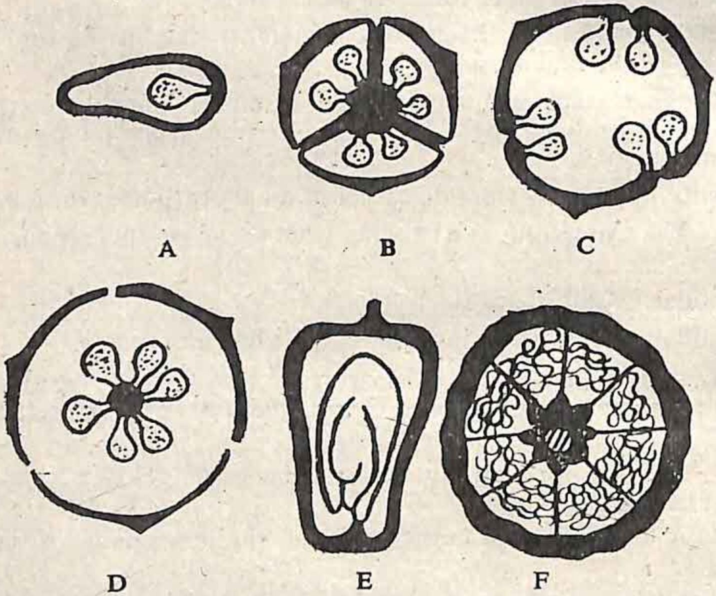


Fig. 25. Various placentation types : A—Marginal ; B—Axile ; C—Parietal D—Free-central ; E—Basal F—superficial

Plagioclimax. An equilibrium is developing in an area in response to extensive grazing.

Plagiotropic, Plagiotropous. The plant members which are arranged at right-angles across the line of the stimulus.

Plankton. The more or less free-floating animals and plants that are living near the surface of a sea or lake.

Plank Root. A root very markedly flattened so that it stands out from the base of a stem like a plank set on edge. They give additional support to the plant.

Plant Geography. *See phytogeography.*

Plaque. A clear area in a plate of bacteria formed due to lysis of bacterial cells following infection of bacteriophage.

Plasmagel. *See cytoplasm.*

Plasmagene. Refers to the self-reproducing particle in the cytoplasm of a cell, affecting the characteristics of the cell bearing it.

Plasmalemma. A thin membrane which is surrounding the protoplasm, or a cell organelle. It is about 1/100 μ thick and consists of fat and protein. It is responsible for the restricted penetration of many substances into the cell. Severe damage to it kills the cell. In plants it is in contact with the cell-wall, and around vacuoles.

Plasmasol. *See cytoplasm.*

Plasmid. Refers to any small piece of DNA which is found in cytoplasm of bacteria. It is being capable of autonomous replication e.g., *R-factors* (*resistance factors* that carry genes for antibiotic resistance in pathogenic bacteria of some types).

Plasmodesmata. The strands of cytoplasm passing through cell walls and connecting the protoplasts of adjacent cells.

Plasmodium. A multinucleate, naked, amoeboid plant-body as found in the Myxothallophyta and some Chrysophyta.

Plasmgamy, Plastgamy. (1) The fusion of cytoplasm, in contrast to the nucleoplasm.

(2) The fusion of 2 sexual cells.

Plasmolysis. Refers to the collapsing of the cell-protoplasm from the cellulose cell-wall, due to the movement of water from the cell-sap into a solution of higher osmotic concentration surrounding the cell.

Plasmon. The cytoplasm of an individual cell, which is considered as a single hereditary unit. The sum of the plasmagenes.

Plasmosome (Nucleolus). A small cytoplasmic granule. A type of nucleolus which stains with acidic dyes, and disappears during mitosis without mingling with the chromosomes.

Plasticity. The ability of a meterial to change shape continuously under applied stress, and retains the impression after the removal of the stress. The plasticity of a soil gives an indication of its moisture content.

Plastic Material. Any substance used up in growth processes.

Plastid. A small, variously shaped, self propogating body present in the cytoplasm of plant cells. They are possibly special centres of chemical activity. They may be coloured (*chromoplast*) or colourless (*leucoplast*). Chloroplasts are specialized plastids.

Plastid Inheritance. Inheritance determined by plastogenes.

Plastid Mutation. A change in a chloroplast which is affecting its ability to produce chlorophyll.

Plastocyanin. A blue copper-containing protein pigment occurring in chloroplast. It mediates transfer of electrons from photosystem II to photosystem I by oxidation and reduction of its copper. Its redox potential is +0.37 volt and it has been situated possibly very close to photosystem I, between cytochrome f and photosystem I.

Plastogene. A gene attached to a plastid, which determines the likeness of the daughter plastid to the parent.

Plastoglobuli. Refer to lipid droplets, 10-500 nm in diameter, occurring singly or in groups in the chloroplast stroma. These are not surronded by membrane but retain their form even when they are isolated from stroma.

Plastoquinone. Said of an electron transferring substance present in chloroplast having a redox potential of zero. It mediates transfer of electrons from photosystem II to photosystem I. It is situated between cytochrome b_3 and cytochrome f and ATP is synthesised during transfer of electron to cytochrome f.

Platyspermic. Used for seeds that are flat, bilaterally symmetrical as in Cordaitales. *Compare* radiospermic.

Plectostele. A type of protostele in which xylem is present in several plates, each surrounded by phloem on all sides as in some species of ***Lycopodium***.

Plectenchyma. A form of 'tissue' which is occurring commonly among higher fungi. It is formed by a mass of interwoven anastomosing hyphae. It is called *prosenchyma* when formed by long fused hyphae and *pseudoparenchyma* when it appears cellular due to regular divisions in hyphae.

Pleiocene (Pliocene). Refers to the last epoch of Tertiary period of Cenozoic era between 13-1 million years ago. In this era climate was rather cold and dense forests were declined. Like woody plants, herbaceous angiosperms and monocotyledonous plants spread rapidly.

Pleiotropy. The production of more than one physiologically uncorrelated effect by one gene. It is attributed to one gene initiating two or more chains of reactions.

Pleiotropism. The condition when one factor is having an effect simultaneously on more than one character in the offspring.

Pleistocene. Refers to a geological period which was lasting approximately from 1 million to 10,000 years ago. During it the four major Ice Ages occurred.

Plerome. Refers to the central core of tissue in the growing point of a stem or root of vascular plants. It gives rise to the vascular cylinder and pith.

Plesiomorphy. Describing a primitive character state, the origin of which could be traced back to a remote ancestor.

Pleurocarpous. Refers to mosses in which reproductive organs are produced laterally and main axis is generally creeping.

Pleuropneumonia Like Organisms (PPLO). Including members of order Mycoplasmatales. They are extremely small parasitic micro-organisms, some only 100 nm in diameter, gram negative, mostly non-motile and not having a rigid cell wall, mostly require sterols for growth and considered to be responsible for certain yellows diseases of plants, also in witches' broom of alfalfa and maize stunt. They are also responsible for the various animal diseases e.g., pleuropneumonia, bovine mastitis.

Plicate. Refers to any structure which is arranged in or having folds as the armed palisade of many gymnosperms and certain angiosperms.

Pliocene. A geological period which is a subdivision of the Tertiary. It lasted approximately from 15 until 1 million years ago.

Pliomorphic (pleomorphic, pleimorphic). Including organisms that are being formed in two or more different forms in their life-cycle as many ascomycete fungi in two conidial states.

Plumule. Refers to the shoot portion of angiospermic embryos in seed and it is derived from epicotyl and is situated between cotyledons in dicotyledonous plants.

Plurilocular Sporangium. A sporangium having many locules e.g., on sporophytic plants of brown alga. *Ectocarpus. Compare* unilocular sporangium.

Pneumathode. Refers to an outlet of the ventilating system of a plant, it usually has some loosely packed cells on the surface of the plant ; through it exchange of gases is facilitated.

Pneumatophore. A specialized root growing vertically upwards into the air from roots embedded in the mud, and, being of loose construction makes gaseous exchange possible for the submerged roots.

Pneumotaxis. (1) Said of the response of reaction of an organism to the stimulus of carbon dioxide in solution.

(2) The response to the stimulus of gases in general.

Pod. A dry fruit which is produced from a single carpel. It is having a single loculus containing 1 (rarely) to many seeds, and usually opening at maturity by splitting along both ventral and dorsal sutures.

Podetium. Refers to an upright secondary thallus of lichens. It is stalk-like, cup-shaped, or much branched.

Podsol, Podzol. A type of soil profile which is developed under good drainage, relatively cool climate, and high rainfall. These conditions lead to leaching so that this soil is typified by having a layer of humus on top, below which is a greyish, leached zone, below which is a darker layer where the leached salts get accumulated.

Polarity. Refers to the condition resulting from the establishment of definite orientation during differentiation as in a cell, tissue or organ. It is important in early growth of plants as is revealed by separate development of root and shoot systems from initially formed bipolar embryo.

Polar Nuclei. Two nuclei in the embryo-sac which unite to give the polar fusion nucleus.

Pollarding. Refers to a form of severe pruning in which all the younger branches of a tree are cut back virtually to the trunk.

Pollen. The microspores of Gymnosperms and Angiosperms.

Pollen Chamber. The cavity which is formed in the apex of the nucellus of Gymnosperms, in which pollen grains lodge after pollination has occurred. The pollen grains slowly develop there and ultimately bring about fertilization.

Pollen Mother Cell (PMC). Describing a somatic cell in the pollen sac of gymnosperms or angiosperms which, after meiosis, produces a tetrad of pollens.

Pollen Sac. A cavity in an anther where the pollen is formed.

Pollen Tube. A tube which is formed on germination of a pollen grain that carries male gametes to the egg, and one to the central fusion nucleus with which it fuses to form the endosperm nucleus from which arises the endosperm.

Pollinarium. Refers to the aggregation of several pollen sacs which are transported as a single pollination unit.

Pollination. Refers to the transfer of pollens from male reproductive organ to female reproductive organ in flowering plants by involving some physical agency like wind, water or air or some biological agency like birds, insects, animals etc. If pollens of a plant reach the female organ of the same plant, it is called *self pollination* and if pollens of one plant reach the female organ of some other plant of same species, it is called *cross pollination*.

Pollination Drop. Said of a drop of sugary fluid which is secreted through the micropyle in gymnosperms. It helps to trap pollens and then the pollen is drawn inside through micropyle to the ovule as the drop is reabsorbed.

Pollinium. A mass of pollen grains which are held together by a sticky substance, and transported as a whole during pollination.

Pollution Carpet. In stagnant and polluted water. a slimy layer is present on the bottom. It consists mainly of bacteria, detritus feeding protozoa, and fungi.

Polyadelphous. Used for an androecium when several of the stamens are joined by their filaments to form several bundles.

Polyandry. (1) Having a large and indefinite number of stamens.

(2) Of oospores formed when more than one functional antheridium is present.

Polyarch. Used for a stele which has many protoxylem strands.

Polyascus. Having many asci, especially when they are in one hymenium and not separated by sterile bands.

Polycarpellary. Consisting of many carpels.

Polycarpic. Able to fruit many times in succession.

Polycarpous. Having a gynoecium which is made up of several free carpels.

Polycentric. (1) Having many centres of growth and development, and more than one reproductive organ.

(2) Of a chromosome or chromatid which has several centromeres.

Polycephalous. Many headed.

Polychasium. A cymose inflorescence in which the branches are arising in groups of 3 or more at each node.

Polychlamydeous Chimaera. A periclinal chimaera in which tho skin is more than two layers of cells thick.

Polycyclic Stele. Refers to the stele in which vascular bundles or meristeles are arranged in concentric rings as in some ferns.

Polymbryony. Refers to the condition of formation of more than one embryo in one ovlue which may undergo development by division of one fertilized zygote (*cleavage polyembryony*) or may undergo development asexually from somatic tissue along with sexual embryo (*adventive embryony*).

Polygenes. Refer to many nonallelic genes all of which influence the same character with approximately additive effects. Such ploygenic systems are also termed as *polymeric systems*.

Polymeric System. *See polygenes*.

Polymorphism. (1) The occurrence in the same habitat of 2 or more distinct forms of a species in such proportions that the rarest cannot be supposed to be maintained by recurrent mutation from any other.

(2) Of a fungus having more than one spore-form.

Polynucleotide. A unit which is made up of several nucleotide units.

|
Base—Ribose
|
Phosphate
|
Base—Ribose
|
Phosphate
|
Base—Ribose
|
Phosphate

Polypeptide. Refers to a peptide chain which is made up of a large number of amino acid residues. Most of the polypeptides are having molecular weight of more than 5000. Protein molecule is compased of one or more polypeptides.

Polypetalous. Refers to the condition of corolla in which individual units (petals) have been freely inserted on the receptacle.

Polyphyletic. Refers to taxa which have been originated from two or more separate ancestral lines.

Polyploidy. Refers to the condition of an individual which possesses more than two sets of genomes in its nuclei. Polyploidy may occur as a result of many situations and polyploids may be autopolyploids or allopolyploids.

Polyribosome (polysome). Refers to a chain of ribosomes attached together by a single molecule of mRNA. These chains are either folded or coiled into complex configurations, often spiral. Ribosomes move along mRNA.

Polysaccharide. A condensation product of monosaccharides. They are insoluble in water. The general formula is $(C_nH_{2n-2}O_{n-1})_x$, where n=4-6 and x may be several thousands.

Polysepalous. Refers to the condition of calyx where its units (sepals) are freely inserted on the receptacle. *Compare* gamosepalous.

Polysome. *See polyribosome,*

Polysomy. Said of the condition of cell or organism which is having several additional copies of some particular chromosome.

Polystely. Refers to the condition of an axis which is having number of independent steles e.g., aerial axes of many species of *Selaginella* where many protosteles ascend into the stem.

Polytene Chromosome. A chromosome having multistranded DNA which is produced due to repeated replication of DNA without subsequent separation. This gives rise to the *giant chromosomes* e.g., salivary gland chromosome of larvae of dipteran insects like *Drosophila*. Such chromosomes find use in cytological and genetical research.

Pome. Refers to a false fruit that is developing from syncarpous, inferior ovary in which succulent edible part is composed of greatly enlarged, urnshaped receptacle which encloses the real fruit at its core. Such fruits are typical of Rosaceae.

Population. (1) A number of the same species living in a definite area.

(2) Genetically, a mating group, limited for special consideration, either by environment or breeding.

Population Dynamics. Refers to the study of time dependent changes occurring in number of individuals in a population and stability characteristics of the population. Both these may also exhibit with physical and/or biotic factors or genetical make up of the population.

Population Genetics. Refers to the study of number, variety, distribution of genes in a population and the changes occurring in the distribution pattern of genes as a result of successive offspring population. *See also* Hardy-Weinberg law.

Porate. *See aperturate*.

Pore (porus). A circular or slightly elliptical germinal aperture present in a pollen grain. *Compare* colpus.

Porogamae. A division of the Angiospermae, including the members in which fertilization occurs through the micropyle.

Porogamy. The entry of the pollen tube through the micropyle.

Porometer. An instrument which is used for measuring the rate at which air passes through a portion of a leaf. It is a means of measuring the degree to which the stomata are open.

Porose. Said of cells which are pierced by pores.

Porous Dehiscence. The liberation of pollen from anthers, or seeds from fruits through pores in the wall of the containing structure.

Porphyrin. Refers to any compound having four pyrrole groups which are joined into a ring by methene (—CH=) groups between their α-carbons. These form an important group of pigments such as chlorophylls, cytochromes and haemochromes.

Position Effect. 1. Refers to the effect of particular position of a gene on the chromosome which gets manifested due to a change in the position of gene on the chromosome following an inversion. 2. Refers to the determination of the appearance of an organism according to whether two nonallelic mutations of a gene are in *cis*-or *trans* arrangement. Position effect forms the basis or *cis-trans* test.

Post Transcriptional Processing. *See messenger RNA.*

Potometer. An instrument which is used for measuring the rate of water-uptake of a shoot.

P*r*. Refers to the inactive form of plant pigment phytochrome which has light aborption peak at about 655-665 nm *i.e.*, in red part of the spectrum. It is interconvertible with **P*fr*** on abosorbing light of appropriate wavelength.

Prairie. Term which is referring to North American glassland.

Precambrian. Refers to the earliest and longest era of geological time between about 4600 and 570 million years ago. It was preceding Palaeozoic era. Rocks of the era had fossils of fungal spores, organisms resembling blue-green algae and fungal hyphae.

Prefloration. *See aestivation.*

Preformation. A theory postulating that either male or female gamete had complete miniaturised version of the adult and that only there occurred an increase in size thereafter. It is refuted and replaced by postulates of epigenesis.

Prolamellar Body. Refers to the three dimensional, regular lattice occurring in etioplasts. It is composed of continuous system of tubules. When tubules are exposed to light, they become pinched off into two dimensional sections of lattice and symmetrical arrangement will be rapidly lost.

Pomeristem. The meristem in an embryo and at the growing point. It consists of actively dividing, uniformly shaped cells.

Prometaphase. Refers to the stage between the dissolution of the nuclear membrane, and the aggregation of the chromosomes on the metaphase plate.

Promycelium (Epibasidium). A short germ-tube which is put out by some fungal spores, on which other spores of different types develop.

Prophage. A bacteriophage that is becoming integrated in the bacterial DNA and is replicating alongwith it. In this state, it is quiescent but it may get separated itself from bacterial DNA at any time and after replication, may result in the lysis of host bacterial cell.

Prophase. The stage in mitosis or meiosis when the chromosomes appear within the nucleus, and, in meiosis undergo pairing.

Proplastid. A minute, self-reproducing inclusion in the cytoplasm from which a plastid may be developing.

Propositus. The individual through which a pedigree gets ascertained.

Prop Root. A root formed from a stem, usually close to the ground. It helps to support the stem.

Prosenchyma. (1) A tissue which is composed of cells having pointed ends. The cells are often empty, and are concerned with affording support and with conducting material.

(2) Plectenchyma in which the hypac are evident and distinct.

Prosthetic Group. A non-protein group which is attached to a protein. If the protein is an enzyme, the prosthetic group is essential for carrying out its functioning.

Protandrous. (1) The male gametes which are developing before the female gametes.

(2) The anthers which are ripening before the stigma(s) of the same flower is receptive.

Protamine. A simple protein of relatively low molecular weight, and a high proportion of bases.

Proteases. Enzymes that are attacking the peptide bond in protein molecules.

Protective Layer. A layer of suberized cells lying across the place where a leaf comes away at leaf-fall. It checks water-loss, and the entry of parasities.

Protein. A compound having carbon, hydrogen, oxygen, and nitrogen, and frequently sulphur and phosphorus. They are synthesized from amino-acids and form one of the main constituents of protoplasm. They are mainly α-amino-acid residues which are joined by peptide linkages.

Proteinaceous Endosperm Layer : *See aleurone layer.*

Proteinase : *See protease.*

Protein Synthesis. Involves the multistage process by which there occurs the joining of amino acids by peptide bonds in the cell cytoplasm in accordance to the information derived from genetic material of cell nucleus thereby forming a specific protein molecule.

Proteolysis. Refers to the breakdown of proteins into their constituent amino acids by proteolytic enzymes.

Proteolytic Enzyme. Any enzyme hydrolysing protein.

Prothallial Cell. (1) A single cell which is cut off early in the division of a microspore of some heterothallic pteridophytes. It represents the vegetative tissue of the male gametophte.

(2) A small cell in the pollen grain of the gymnosperms, representing the male prothallus.

Prothallus, Prothallium. The independent gametophyte plant of the Pteriodophyta. It is a small, green parenchymatous thallus bearing antheridia and archegonia. It shows little differentiation, and is usually prostrate on the soil-surface, to which it is attached by rhizoids.

(3) The similar stages in the life-cycle of the gymnosperms.

(4) The earliest stages in the development of a lichen thallus.

Prothecium. A primitive or rudimentary perithecium.

Protista. A term sometimes used to include all unicellular organisms, both plant and animal.

Protobiont (coacervate). Refers to an aggregate of large complex organic compounds which are bounded by an organic membrane. Such aggregates are regarded as precursors of living cells in certain theories of origin of life.

Protocooperation (facultative mutualism). Used for describing the mutually beneficial biotic interaction in which both organisms can also live independently e.g., symbiotic relationship between *Rhizobium* bacterium and leguminous plant.

Protoderm. Said of the outermost layer of apical meristem. Its derivatives give rise to epidermis and sometimes also to associated subepidermal tissue.

Protogyny. Refers to the maturation of female reproductive organs before there occurs the maturation of male organs as in Rosaceae and Cruciferae.

Pressure Potential (turgour potential). Refers to a component of water potential which is denoted by symbol ψ_p. It may be defined as the pressure exerted by cell contents on the cell wall (*turgour pressure*) and is usually positive but may be zero in cells at incipient plasmolytic stage or that are plasmolyzed. Negative pressure potential may also be developing in xylem elements due to rapid transpiration and the resistance of tissues to water flow.

Prickle. Said of an outgrowth of epidermis which is short, hard, woody and pointed. It may be simply protective or may be helping the plant in hooking itself to some support as the curved prickles of roses. *Compare* spine, thorn.

Primary Consumer. Refers to an organism whose position is just after producer in the food chain in the ecosystem. It uses producers as its food material. Herbivores are primary consumers in autotrophic ecosystem.

Primary Endosperm Nucleus. A nucleus formed after fusion of polar nuclei or definitive nucleus of embryo sac with one of the male gametes released from the pollen tube.

Primary Growth. Refers to an increase in size occurring due to cell division at apical meristems and subsequent cell enlargement. Tissues produced in this way are termed as *primary plant tissues*.

Primary Phloem. Said of phloem tissue which is derived from the procambium in the primary plant body.

Primary Pit Field. Used for an area in the primary plant cell wall which is having greatly reduced thickness and usually penetrated by plasmodesmata. It is responsible for relatively easy transfer of materials between cells (a function similar to pits).

Primary Plant Body. Refers to the body of a plant that is made up of primary plant tissues only. It is derived from primary growth.

Primary Ray : *See medullary ray.*

Primary Thickening Meristem. The meristem occurring in certain monocotyledons (e.g., palms) below the leaf primordia at the apex. It tends to increase width of the stem behind the apex by cutting rows of cells by periclinal divisions.

Primary Tissue. Tissue formed from cells which are derived from the primary meristems.

Primary Trisomic. A plant having the ordinary diploid chromosome complement together with one extra chromosome.

Primary Xylem, Primary Wood. The xylem that is formed from a procambial strand and present in a primary vascular strand. It consists of protoxylem and metaxylem.

Prime Type. In *Datura*, one of the homologous types of chromosome structure distinguished from other types by interchange, and used as a basis of reference.

Primitive. Original; first-formed; of early origin.

Primodium. The earliest recognizable rudiment of an organ or structure in development.

Probasidium. A teliospore, or the basidium from nuclear fusion to the start of the epibasidium, sterigma, or spore development in any basidiomycete.

Procambium. A tissue of elongated, narrow cells grouped into strands. It is differentiated in the plerome just behind the growing point in stem and root of vascular plants. It gives rise to the vascular system by further development.

Procarp. The multicellular female organ of the Rhodophyta, having an archcarp and trichogyne.

Procaryotic : *See prokaryotic.*

Procumbent. Said of a plant or its part that is trailing loosely along the ground surface.

Producer. Refers to an organism that is occupying first place in the food chain of autotrophic ecosystem.

Proembryo. Refers to young plant individual that is formed after fertilization but before it is differentiated into embryo and suspensor tissues.

Profile Diagram. The scale diagram which is prepared from the recorded results of profile transect.

Profundal. Refers to the region of a lake or pond below the depth of 10 m where there occurs little oxygen, light or warmth. Region is having few green plants though bacteria, fungi, molluscs and insect larvae are usually present.

Progeny Test. Refers to the method of assessing the genetic character of an individual by the performance of its progeny.

Progressive Cleavage. The cleavage of the nucleus or cells one after the other to form 2, 4, 8 etc. daughter-cells one after the other.

Progressive Endosymbiotic Theory : *See serial endosymbiotic theory.*

Progymnosperm. Refers to any of certain plants that are known from fossils from Devonian period that show various characteristics that are intermediate between non-seed-bearing and seed-bearing plants. They undergo heterosporous reproduction and have characters of anatomy which are found in early gymnosperms such as wood fibres in cortex and secondary phloem.

Prokaryotic (procaryotic). Refers to cells in which nuclear material does not get separated from cytoplasm by any nuclear membrane. This term is usually used to describe bacteria and blue-green algae (but not viruses) that have such cells which are making up their body.

Protonema. (1) One of the initial branches produced from a germinating spore of the Charales. One branch of the protenema ultimately produces the new plant. (2) The filamentous or plate-like stage which is produced from the developing spore of the mosses. It produces the gametophore by vegetative means.

Protopectin. A substance which is similar to pectin, but having longer chains, perhaps connected by metals. It occurs in cell-walls, especially of algae.

Protophloem. The first phloem which is formed from the procambial strands. It may be generalized in structure having poorly formed sieve tubes and no companion cells.

Protophyte. (1) The gametophyte in an alternation of generations when the two generations are unlike. (2) A simple unicellular plant.

Protoplasm. The substance within and including the plasma-membrane of a cell or protoplast, but excluding vacuoles, cell-wall mass secretions. It gets differentiated into the nucleus and cytoplasm.

Protoplasmic Circulation. The streaming motion that may take place in the protoplasm of living cells.

Protoplasmic Respiration. Respiration taking place at the expense of protein materials in a starved plant.

Protoplast. The protoplasm, as distinct from the cell-wall.

Protoplast Fusion. Used for describing induced fusion of naked (wall-less) plant cells under culture conditions. Naked cells are obtained by enzymatic digestion of cell walls, osmotic shock etc.

Protosome. A hypothetical central body present body in a gene.

Protospore. Refers to the Synchytriaceae when a uninucleate piece of protoplasm becomes the sporangium.

Protostele. Used for the most simple and primitive form of stele which consists of a central rod of xylem surrounded by a cylinder of phloem and occurs in the stems of some ferns and lycopods, and is found more or less universally in roots.

Protothallus. Used for describing the first stages in the formation of a lichen thallus, often before the fungus and alga have become assoiciated.

Provascular Tissue : *See procambium*.

Proximal. (1) Situated towards the point of attachment.

(2) The part of a chromosome arm which is nearer to the centromere than another part.

Pruinose. (1) Covered with a waxy or powdery bloom.

(2) Covered with minute points which give a frosted appearance to the surface.

Prunasin. A glucoside in the bark of wild cherry. It is *d*-mandelonitrile glucoside.

Pruning. Used for describing the practice of cutting back some or all of the branches of a woody plant. It is done for removing dead or diseased wood, for changing plant into a desired shape, for promoting vigour of plant in case of fruit trees, for maintaining balance between vegetative growth and fruit formation.

Psammon. Refers to group of organisms that live between sand particles on a lake or sea shore. The food for bacteria, protozoa, and other heterotrophic organisms of psammon is provided by diatoms and other algae.

Psammosere. Refers to the complete set of communities that develap in sandy habit during succession and ultimately gets stabilised such a habitat. *See also* succession, sere.

Pseudoalleles. Two or more mutations that are taking place in different parts of the same gene but causing similar effects on the phenotype.

Pseudocarp. 1. **(false fruit).** Used for describing a fruit that incorporates tissues other than those derived from gynoecium. It may be developed from a single flower and include receptacle (pome) bracts etc. or may develop from whole inflorescence (multiple fruit). 2. Used for describing a particular type of pseudocarp composed of a number of achenes that remain embedded in the outer surface of a fleshy receptale e.g., fruits of strawberry. (Fig. 26).

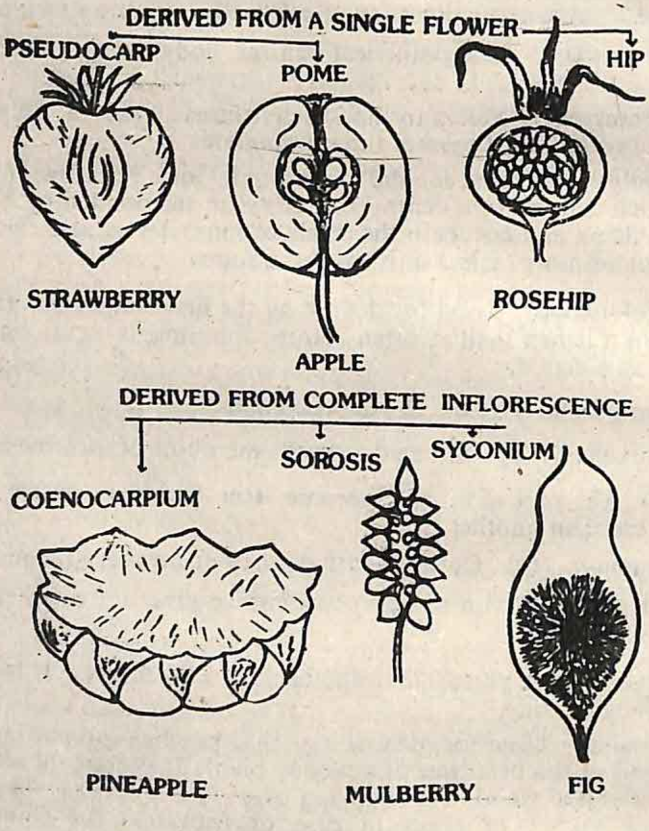


Fig. 26. Various forms of pseudocarp.

Pseudocopulation. Refers to the attempted copulation by a male insect with a flower or its part which appears as female insect of its own species due to strikingly similar shape, colour or scent of the flower. Such attempt causes the pollination of the flower. This pollinating mechanism frequently occurs in Orchidacae.

Pseudoendosperm. 1. Refers to the endosperm which is developed without involving fusion of polar or definitive nucleus with a male gamete but arising spontaneously from definitive nucleus or from somatic tissue. 2. Refers to the tissue of female gametophyte in gymnosperms that nourishes the embryo. It is haploid and thus it is not analogous to endosperm of angiosperms.

Pseudogamy. Refers to a form of apomixis in which a diploid embryo is produced without fertilization though stimulus from male gamete is needed to initiate it and so pollination becomes necessary.

Pseudoparenchyma. Refers to the plectenchyma having the appearance of parenchyma due to regular divisions in the fused hyphae. It is usually seen in fungi but also in certain red algae.

Pseudoperianth. Said of a relatively late-developing membranous sheath which is surrounding the young sporophyte in some liverworts e.g., *Fossombronia*, sometimes also called *perigynium* (*See* perichaetium).

Pseudoplasmodium. A small slug-like aggregation of myxamoebae which is acting as a unit but within which each myxamoeba remains distinct. Its fruiting structure is a *sorocarp*.

Pseudopodium. I. A leafless stalk used to raise the capsule in mosses that do not have the seta e.g., in *Sphagnum*. 2. An extension in the body which is formed by flowing of cytoplasm into that area of the body that serves as a means of movement in amoeboid gametes.

Pseudothecium. A type of ascocarp which characteristically occurs in Loculoascomycetes and is superficially similar to perithecia but having double-walled asci that also differ in their development. They are often called perithecia.

Ptyxis. *See vernation.*

Pubescent. Having fine short hairs.

Puff Balls. Refers to certain members of order Lycoperdales of Gasteromycetes in which basidiocarp do not open until maturity and its contents become dry and powdery. The ball shaped basidiocarp releases spores in a series of puffs when it is disturbed e.g., *Lycoperdon pyriforme*.

Pulvinus. 1. Refers to the prominent swollen base of a petiole or pinna composed of motor cells that can rapidly lose water into or out of their vacuoles thereby resulting rapid changes in their turgour which is responsible for certain sleep movements and haptotropic movements. 2. Used for thickened region in the stem or leaf sheath of grasses, often having intercalary meristem.

Punctuated Equilibrium. Refers to a theory of evolution postulating that species often arise rapidly in a short period of speciation lasting less than 100,000 years and then it is followed by a very long period of stasis that may last several million years before next such cycle of speciation and stasis comes. It means that evolution takes place in bursts punctuated by periods of stasis rather than by gradual change.

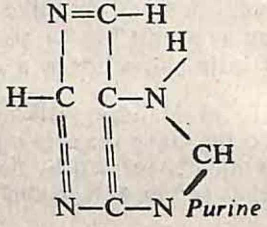
Punnet Square. Used for describing a chequerboard diagram which is attributed to geneticist R.C. Punnet. It is used to illustrate how gametes involved in a particular cross result in the formation of various genotypes in various frequencies.

Pure Culture. Said of a culture of a pure stock of one species of plant. The term is used especially for bacteria, fungi, and bacteria.

Pure Line. (1) The descendants which are obtained from self-fertilisation of a single homozygous parent.

(2) An inbred homozygous strain.

Purine Group. A group of cyclic diureides which are derived from one molecule of a dibasic hydroxyacid and two molecules of urea. The simplest is purine.



Purple Sulpher Bacteria. Said of photosynthetic bacteria of Chromatiaceae or Thiorhizodaceae.

Pycnidium. The fertile layer of an Ascomycete when it lies in a cup or flask-shaped cavity that is open from the beginning.

Pycniospore. Of Uredinales, a spore from a pycnium, a spermatium. Sometimes used for a pycnidiospore.

Pycnosis. (1) Contraction of the nucleus when the cell dies. It forms a compact, strongly-staining mass.

(2) The formation of a perithecium under the cover of the tissue of a stroma.

Pycnospore. A spore formed inside a pycnidium.

Pyramid of Biomass. Used for describing a pyramid shaped diagram in which each horizontal bar is denoting the total biomass present at a time in a trophic level of the ecosystem that is being studied. Lowermost bar is denoting producers and above it are bars denoting herbivores and carnivores successively. Such a diagram may be having the shape of inverted pyramid also in certain types of ecosystems.

Pyramid of Energy. Used for describing the pyramid shaped diagram in which horizontal bars are representing total amount of energy passed on form one lower to next higher trophic level in unit time in the ecosystem being studied while the lowermost bar is representing the energy passed on from abiotic component to producers and topmost bar is representing the energy passed on from next lower carnivore level to the top carnivore level.

Pyramid of Numbers. Used for describing the pyramid shaped diagram in which each horizontal bar is representing the total number of organisms in one trophic level in the ecosystem being studied, lowermost bar for producers and uppermost for top carnivores. The shape of diagram may undergo partial inversion in case of a forest ecosystem.

Pyranose Ring. A 6-membered ring having 5-carbon atoms and one oxygen atom and is formed by any aldose sugar with 5 or more carbon atoms.

Pyrene. A small hard body having a single seed, rather like the stone of drupe, but many pyrenes may be found in a single fruit.

Pyrenium. An obsolete term for the sporocarp of the Sphaeriales.

Pyrenocarpeae. A series of the Ascolichenes in which the fruit-body is a perithecium.

Pyrenoid. A small round protein granule storing starch around it as a sheath. They are found singly or in numbers embedded in the chloroplasts of various algae and bryophytes.

Pyridine Alkaloids. Used for a group of alkaloids whose structure is based on pyridine nucleus (a 6-membered ring of five carbon and one nitrogen atom and three double bonds). Examples are hemlock alkaloids e.g,, coniine present in hemlock. *Conium maculatum*).

Pyrimidine. Said of a nitrogen-containing organic base which is composed of a single heterocyclic ring. Two pyrimidines, cytosine and thymine, are constituents of DNA while uracil and cytosine are constituents of RNA.

Q

Q_{10} A sign for the increase in the rate of a process produed by increasing the temperature by 10°C, given as the numbers of times the old rate goes into the new rate. For biological as well as chemical processes, it is often between 2 to 3.

Q_{co_2}. The number of cubic mm. of carbon dioxide, measured at N.T.P. (S.T.P.) which is exchanged per hour per milligram dry weight.

Q_{o_2}. The number of cubic mm. of oxygen, measured at N.T.P. (S.T.P.) which is exchanged per hour per milligram dry weight.

Qenzyme : A branching enzyme which is responsible for the formation of α (1—6) bonds in the synthesis of amylopection.

Quadrat. A square space of country which is marked out for observation as representative of the plant growth in that part.

Quadripolar spindle. An achromatic spindle having 4 poles. It occurs in spore-mother-cells which are dividing.

Quadrivalent. (1) An association of 4 chromosomes which are held together between diplotene and metaphase of the first meiotic division, chiasmata.

(2) A nucleus possessing 2 pairs of homologous chromosomes, or an individual having such nuclei.

Quadruplex. A polyploid in which a particular dominant allelomorph is present 4 times.

Qualitative Characters. The characters of community studied by subjective assessment and may be grouped in point scales. For plant communities examples of such characters are physiognomy, phenology, stratification, sociability, vitality, life forms, interspecific association, floristics etc.

Qualitative Variation (discontinuous variation). The expression of a characteristic in perceptibly different ways by different individuals of a population. Such variation may be attributed to either recurrent mutation or to the existance of a balanced polymorphism. Mendelian characteristics are examples of qualitative variation.

Quantasome. Spherical structures present in thylakoid membrances, some 17.5 nm and other 11.0 nm in diameter. They are embedded in the lipid phase of membrane having their edges which are protruding from membrane surfaces. These particles are believed to be essential to the light reactions of photosynthesis. Pigment present in smaller particles is P_{700}, form of chlorophlly-*a* and that in larger particles is P_{680} form of chlorophyll-*a*.

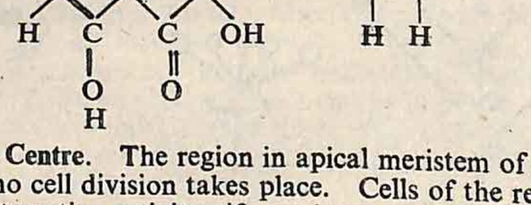
Quantitative Characters. The characters of community employed in the ecological description which can be quantified and objectively studied. Examples for such characters are population density population frequency, population abundance, population dominance, association index etc. for constituent species.

Quantitative Inheritance. The inheritance of characters in which the variation is continuous.

Quantitative Variation. (continuous variation). The type of variation shown by a characteristic which is exhibited by all the members of a population to a greater or lesser extent. An example is the size of ears in a cereal crop. Such characters have been found to be strongly influenced by environment and are determined by many genes each with a small effect.

Quaternary. The second period of Cenozoic era from about two million years ago to present day. It has been divided into Pleistocene and Holocene epochs. At its start, climate was cool and temperate and during it there were four glacial ages. Many plant and animal species become extinct during this period. In the present Holocene epoch, crop plants and their associated weeds had been originated with rise of human civilization.

Quercitin. A flavonal which is found in the free state or combined in glycosidal forms in a wide range of flowers, leaves etc.



Quiescent Centre. The region in apical meristem of a root in which little or no cell division takes place. Cells of the region could undergo meristematic activity if meristem initials are damaged thereby acting as reservoir of potential initials and are protected from damage by their relative inactivity. The centre may also be used as site of auxin synthesis.

Quillworts. The members of pteridophyte genus *Isoetes* belonging to order Isoetals. About 70 species are known.

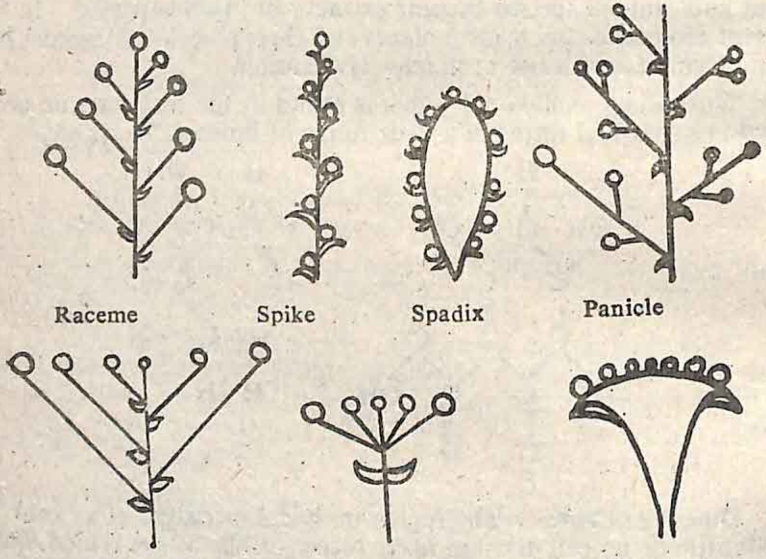
Quincuncial Aestivation. A particular type of imbricate aestivation in a five-petalled corolla in which two petals overlap their neighbours by both edges, two are overlapped on both their edges, and one overlaps one neighbour, and is overlapped by the other.

Quinone Fungicide. Any fungicide which gets developed from chlorinated quinones e.g., chloranil used as seed dressing and dichlone used as foliar fungicide.

R

Race. A group of plants (or animals) inside a species which possess enough special points in common to be grouped together but are not different enough from the rest to make a separate species.

Raceme. An indefinite flower grouping in which stemmed flowers appear on one side and then on the other side of a chief stem, the order of development is from the base up.


Raceme Spike Spadix Panicle

Corymb Umbel Capitulum

Fig. 27 Type of Racemose Inflorescence.

Racemose Inflorescence (indefinite inflorescence). An inflorescence in which growth continues at apex of main axis and primary laterals and flowers get developed from axillary meristems. The older flowers are present towards base and younger flowers towards apex. Various types of racemose inflorescene are raceme, capitulum corymb, panicle, spike, catkin, spadix and umbel. (Fig. 27).

Rachilla. The axis in the centre of a grass spikelet.

Rachis. (1) The main axis of a pinnately compound leaf, to which the leaflets are attached, e.g., a fern frond.

(2) The main axis of an inflorescence.

Radial. Used for a longitudinal section which is passing along a radius or diameter of a cylindrical organ.

Radial Bundle. A vascular bundle in which the primary xylem and phloem are lying on alternate radii. They usually occur in roots.

Radial Symmetry. If an organ or organism can be split down by any radius longitudinally to yield two identical halves, it is said to be radially symmetrical.

Radical. Used for leaves which are arising from the base of the plant at ground-level.

Radicle. (1) The part of an embryo plant.

(2) Any very small root.

(3) A rhizoid of a moss.

Radiculose. The 'stem' of a moss which bears many rhizoids at the base.

Radiosperm. (1) A seed approximately circular in cross-section.

(2) A plant, especially fossil forms, bearing such seeds.

Raffinose. A trisaccharide sugar ($C_{18}H_{32}O_{16}$). It is made up of a galatose residuce, a glucose residue and a fructose residue. It is found particularly in cotton seed and sugar beet.

Rain Factor. An expression for the humidity as a function of rainfall and temperature. It may also be defined as the ratio of the mean annual rainfall in mm to the mean annual temperature in °C.

Rain Forest (tropical rain forest). Used for a forest which is occupying region of low altitude near equator having annual rainfall of more than 80-90 inches and uniform warmness throughout the year, especially in Amazon and Orinoco basins in South America and Central American Isthumus, Congo, Niger and Zambezi basins of central and western Africa and Madagascar and in Indo-Malayan region, Borneo, and New Guinea regions.

Ramentum. Any of the small, thin, brown scales seen on the stems and leaves of ferns.

Ramet. Any individual that is belonging to a known clone. Finds especial use in quantitative studies of phenotypic plasicity in relation to environmental factors.

Ramification. The system of branching of a plant, the order of its branches.

Ramulus. A very small branch.

Rank. The level or position which is occupied by a category in the taxonomic hierarchy *e.g.*, class, family, genus etc. Each rank is indicated by a particular suffix, *e.g*, rank subkingdom ends in bionta, division in -phyla, subdivision in phytina, class in-opsida, subclass in-idae, order in-ales, suborder in-inea, family in-aseae, subfamily in-oideae, tribe in-eae and sudtribe in-inae.

Raphe. (1) An elongated mass of tissue having a vascular bundle, and lying on the side of an anatropous ovule, between the chalaza and the attachment to the placenta.

(2) A slit-like line which is running longitudinally on the valve of a diatom to indicate the position of a narrow slit in the wall ; it bears a nodule at each end and one in the middle.

Raphide. A needle-shaped crystal, generally of calcium oxalate, which is found in bundles, rounded masses, or singly in certain plant cells.

Raunkiaer System of Classification. A method of plant classification postulated by Danish botanist C. Raunkiaer. In this system plants are divided into groups depending upon the degree of the protection in condition of drought or/and cold and the position of perennating organs. System finds use in ecological grouping of vegetation in different regions and compaiing these groups in different climatic conditions. The various categories of plants are chamaephyte, cryptophyte, hemicryptophyte, phanerophyte, therophyte, etc (Fig. 28).

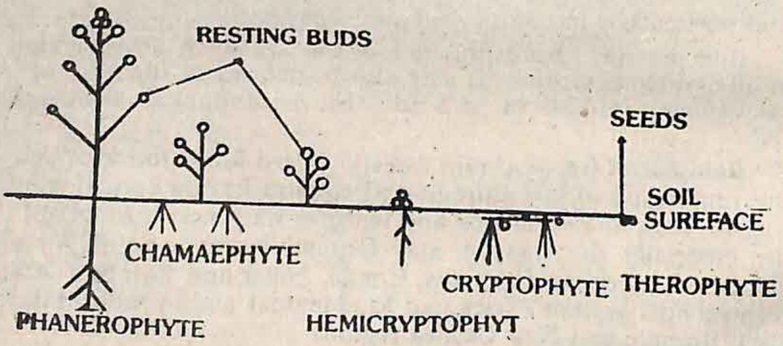


Fig. 28. Raunkiaer's life forms.

Ray. The non-vascular tissue which is developed in a stele. Between the primary vascular bundles there is the *interfascicular ray,* and that developed in the secondary vascular tissue, by division of the cambium, there is a *vascular ray*.

Ray Floret. One of the small flowers radiating out form the margin of a capitulum or other dense inflorescence.

Ray Initial. One of the cells of the cambium that is taking part in the formation of a ray.

Ray Floret. *See capitulum*.

Ray Tracheid(e). A thick-walled cell occurring in the vascular rays of pines. It possesses bordered pits and conducts aqueous solution horizontally.

Reaction. Any change taking place in the activity of an organism in response to a stimulus.

Reaction Time. The time interval between the application of a stimulus and the appropriate reaction.

Reaction Cetre Pigments. *See* P_{680}, P_{700}.

Reaction Wood. Used for structurally abnormal wood which is formed in response to various stresses. In gymnosperms, it is called *compression wood* and is formed on the lower sides of branches. It is dense due to heavy lignification. In angiosperms, it is called *tension wood* which is formed on the upper side of branches and fibres are gelatinised rather than lignified.

Recalcitrant Seed. A seed losing viability on storage for any length of time even under conditions normally used for seed storage *e.g.*, seeds of many tropical plants *e.g.*, coconut, rubber, tea, etc. Such seeds can be stored for only one season.

Recapitulation Theory. Theory postulated by Ernst Hackel. According to this ontogeny of organ or organism is a speeded up recapitulation of its phylogeny and the developmental stages resemble adult forms of ancestors in evolutinonary sequence. Theory has been discarded by many.

Receptacle. (1) In fungi, a spore-bearing structure, especially if it is more or less concave.

(2) In algae, the swollen end of a branch which bears reproductive organs.

(3) In liverworts, a cup which has gemmae.

(4) In ferns, the cushion of tissue which bears the sporangia.

(5) In flowering plants, (*a*) The more or less enlarged end of the flower-stalk which bears the flower-parts ; (*b*) The enlarged end of a peduncle which bears the flowers of a crowded inflorescence.

(6) In fungi, an axis which has one or more organs.

Receptive Body. A small branched or unbranched process from the stroma, which is capable of being 'spermatized' bo microcondia.

Receptive Spot. The clear area in the female gametes of some fungi and alage, through which the male gametes are entering.

Receptiveness. The condition of a stigma when effective pollination, and fertilization is possible.

Recessive. Used for the allele which can be expressed only in homozygous condition and its expression gets suppressed in heterozygous condition by the other (dominant) allele.

Reciprocal Cross. A cross in which the source of male and female gametes has been reversed. Such cross is mainly used for identifying influence of maternal (or paternal) factors, if any, on the inheritance of characteristics.

Reciprocal Translocation. Describing translocation which involves exchange of segments mutually between two non-homologous chromosomes.

Recombinant DNA. (1) The genetic material in which crossing over or chromosome reassortment has taken place naturally.

(2) The genetic material having novel gene sequences which is produced by techniques of genetic engineering (recombinant DNA technology).

Recombination. The formation in the offspring, of combinations of genes not present in either parent. It is carried out by crossing-over or segregation at meiosis, and/or the random union of different sorts of gametes at fertilization.

Recon. The unit of inheritance which gets transferred as a unit during recombination. This definition has been found to be true for genes of most of the characters but not in all the cases.

Recurrent. Used for the small veins of a leaf, when they bend back towards the mid-rib.

Recurrent Parent. Used for the parent of cultivated variety which has been backcrossed with the donor parent and the backcross progenies repeatedly.

Red/Far Red Effects. The physiological responses of many plants when they are exposed to illumination by red or far red light. Generally effects of two lights get reversed on exposure of opposite type of light *i.e.*, effect of red light gets reversed by exposure to far red light and vice versa.

Red Algae. *See Rhodophyta.*

Red and Yellow Forest Soil. A type of zonal soil which is acidic (a pedalfer and is formed in wet subtropical regions due to which leaching accumulates salts in B-horizon. Red colour is attributed to iron oxides in A-horizon but if soil is sandy, it is yellow. Such soils have little humus and soon get exhausted on cultivation. Soils get eroded easily.

Red Desert Soil. A type of coarse, zonal soil which is rich in lime and salts (a pedocal) but poor in humus. It is formed in hot deserts and cultivable when irrigation is available.

Redox Potential. The tendency of a reducing agent to lose electrons or an oxidizing agent to gain electrons measured against a known standard, generally the hydrogen. Thus it expresses the reducing or oxidizing capability of a substance. The reaction is conveniently written as follows :

$$\text{Oxidant} + ne^- = \text{reductant}$$

where n represents the number of electrons transferred.

Redox Reaction. *See oxidation-reduction reaction.*

Red Snow. Used for snow which is stained by a surface growth of unicellular algae, rich in haematochrome.

Red Tropical Soil. A type of zonal soil which has been formed in rain forests and savanna having alternating dry and wet seasons. It is heavily leached but balance of nutrients is maintained by decomposition of organic litter. The red colour has been attributed to the presence of iron, magnesium and aluminium oxides. Some tropical oils may form a hard crust of chemical on the surface.

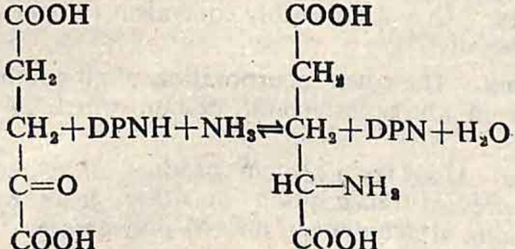
Reducing Sugar. Any sugar reducing an oxidizing agent. Such a sugar is having a potentially active aldehyde or ketone group and all monosaccharides are sugars. In reducing disaccharides, one of the reducing groups of either of component monosaccharides is left intact. Various solutions such as Fehling's solution or Benedict's solution detect reducing sugars.

Reductases. Used for flavoproteins which are enzymes that carry out reductions *e.g.*, of nitrate (NO_3^-) ions to ammonium (NH_4^+) ions. They also play role in the oxidation of NAD and NADP.

Reduction Division. The nuclear division during meiosis in which chromosome number becomes halved.

Reduction Separation. Using for the separation of homologous parts of non-sister chromatids at anaphase of one or other meiotic division.

Reductive Amination. Used for the reduction of a substance by the addition of an NH_2^- radical, *e g.*, α-ketoglutaric acid is converted into to glutamic acid.



$$\begin{array}{lcl} COOH & & COOH \\ | & & | \\ CH_2 & & CH_2 \\ | & & | \\ CH_2 + DPNH + NH_3 & \rightleftharpoons & CH_2 + DPN + H_2O \\ | & & | \\ C{=}O & & HC{-}NH_2 \\ | & & | \\ COOH & & COOH \end{array}$$

α-Ketoglutaric acid Glutamic acid

Reflexed. Used for structure that is bent sharply backwards, such as the petals of *Cyclamen*.

Regeneration. (1) The growing again of a part or organ which has been lost by injury.

(2) In bryophytes, the growing of a diploid gametophyte directly from a sporophyte after injury.

Regma. A fruit, which breaks up into rounded one-seeded portions when it is ripened.

Regulatory Gene. A gene whose product is able to prevent or promote the transcription of other genes.

Relative Humidity. Defined as the ratio of actual amount of water vapour present in a body of air at a temperature and the amount of water vapour required to completely saturate that body of air at that temperature. The figure is expressed in percentage.

Relative Sexuality. The occurrence in a species of strains giving gametes which are able to fuse with those produced by either of the normal strains.

Renaturation. The process in which denaturated protein has regained its characteristic coiled structure (native form) and its activity.

Rendzina (calcisol). A shallow interzonal soil which is rich in lime (calcimorphic) formed from the underlying limestome or chalk rocks having brown or black A-horizon, B-horizon, if distinguishable, is grey or yellowish with limestone fragments.

Renner Effect. The competition between 4 genetically different spores which are formed at one meiosis in regard to which shall form the embryo-sac.

R-Enzyme. One of the enzymes which breaks down the 1 : 6 linkages in the starch.

Repeated Sequence. Any long base-pair sequence which is found at many different places throughout the chromosomes excluding the DNA coding for structural genes. These sequences could be divided into 3 categories. *repetitive DNA*, *highly* or *repetitive satellite DNA* and *palindromes*.

Repetitive DNA. Generally having widely scattered sequences of about 300 base pairs length, which are usually adjacent to structural genes. They are possibly equivalent to operator genes of bacteria functionally.

Replication. The equal incorporation of all combinations two or more times in an experimental design, which is then called replicated.

Repressor. Used for a protein product of a regulator gene that is able to prevent transcription of other genes by binding to the DNA, blocking attachment of mRNA polymerase.

Reproduction. The process of forming new individuals while the species is perpetuated.

Reproductive Isolation. The prevention of gene flow which is taking place between all the members of a population due to development of isolating mechanisms thereby forming distinct non-breeding groups that in the course of time, may undergo development to form new species.

Repulsion. (1) The presence of two given genes in different homologous chromosomes.

(2) The tendency shown by dominant characters to separate.

Resin. An acidic substance which is either a phenolic derivative or an oxidation product of terpenes. The resins are insoluble in water, but soluble in alcohol. ether, and carbon disulphide, and burn with a sooty flame. They are products of secretion or disintegration which generally occur in special cavities or passages.

Resin Canal. An intercellular space, which is often bordered by secreting cells, and has resin or turpentine.

Resistance. (1) The capability of an organism to withstand more than the normally lethal dose of a toxic substance.

(2) The ability of a plant for remaining productive if it is attached by a parasite which would normally kill it. or reduce its productivity below an economic level.

Respiration. (1) The chemical reactions breaking down complex molecules to simple ones, releasing energy, sometimes called ***cell-***, ***internal-***, or ***tissue-respiration***.

(2) The taking in of oxygen and the releasing of carbon dioxide. This is better known as ***gaseous exchange***.

Respiratory Chain. A series of membrane-bound oxidation-reduction reactions in mitochondra which involve the transfer of electrons from reduced cofactors formed in TCA cycle and other dehydrogenase reactions to oxygen which then reacts with hydrogen ions to form water. Presently, there are seven different electron transferring enzymes or cofactors between starting point NAD and oxygen.

Respiratory Chromogen. A colourless substance which forms coloured one on oxidation or reduction. It may play a part in respiration.

Respiratory Enzyme. An enzyme catalysing oxidation-reduction reactions.

Respiratory Index. Defined as the number of milligrams of carbon dioxide liberated from 1 g of plant material (dry-weight) at 10°C, when the amount of respirable material is unlimited, and when the oxygen is present in the same proportion as it is present in the ordinary atmosphere.

Respiratory Quotient. Defined as the ratio of the volume of carbon dioxide expired to the volume of oxygen consumed during the same time. It provides a rough idea of the food material that is being oxidized.

Respiratory Root. See *pheumatophore.*

Response. The change in an organism, or part of it, usually adaptive, which is produced by a stimulus.

Response Curve. A graph obtained between the amount of a stimulus or substance applied, and the response. The term is useful especially in relation to experiments such as fertilizer trials etc.

Resting Nucleus-Metabolic Nucleus. A nucleus which is not undergoing division.

Resting Period, Resting Stage. Any time in the life of a plant or plant organ when there appears no growth or activity.

Resting Spore. (1) A spore germinating after a resting period.

(2) A thick-walled spore which can survive adverse conditions, remaining dormant for some time before it gets germinated.

Resting Stage. Used for a nucleus, when the chromosomes are not clearly visible as individuals.

Restitution. The formation of the original chromosome after breakage, especially by X-ray.

Restitution Nucleus.. The single nucleus formed instead of two due to the failure of the first or second division of meiosis.

Restriction Enzyme (restriction endonuclease). An enzyme recognising and binding to specific, short sequences of double-stranded DNA and cutting it at or near this point. Such enzymes are formed in certain bacteria in response to invasion by bacteriophage for cutting and destroying the phage DNA. These form a most useful tool in gene engineering.

Reticulate Chloroplast. A complex plastid which is forming cylindrical network in the peripheral region of the cells of some green algae *e g., Oedogonium.*

Reticulate Thickening. A type of thickening pattern in secondary wall of tracheary elements in which secondary wall is forming a network. Such thickening does not permit much further elongation and,is therefore, found in metaxylem which has already completed elongation.

Reticulodromous. Used for describing net-like, reticulate leaf venation *e.g.*, in *Rhododendron.*

Reverse Transcriptase. An enzyme which is present in certain microorganisms. It reverses the normal transcription sequence and synthesizes DNA strand from mRNA. It finds use in producing intron-free DNA for gene engineering.

Revolute. Rolled back, specially onto the underside as the edges of some leaves.

R-Factor. See *plasmid.*

R_f Value (relative front). A value in chromatography which is found out by dividing the distance moved by the solute spot on the chromatogram by the distance moved by the solvent front. As the value remains constant for a particular molecule, it is used in chromatographic identification of molecules.

Rhachilla. See *rachilla.*

Rhachis. See *rachis.*

Rhamnose. A methylated pentose sugar which does not occur in free state but generally as constituent of many glycosides *e.g.*, flavonol glycoside quercitrin. It also occurs in certain gums *e.g.*, gum arabic, mucilages and in bacterial polysaccharides and is also identified in free state in *Rhus toxicodendron.*

Rhipidium. A monochasial cyme in which the branches are lying in one plane, so that the whole appears fan-shaped, *e.g.*, in certain species of *Iris.*

Rhzanthous. Used for forming flowers from the root.

Rhizoid. Any of the thin root-like outgrowths in Musci, Filicales, and certain Fungi and Algae, by which the fruit-producing plant gets fixed to the earth.

Rhizodermis (epiblem). Used for outermost layer of cells in roots. Term epidermis is also employed for this layer.

Rhizome. A thick root-like stem under the earth. It is frequently parallel to the top of it. It is sending roots down from its lower side and stems up from its top side and living from year to year.

Rhizomorph. A tough cord-like mass of fused hyphae which are used for moving a fungus from from one favourable location to another across unsuitable substrates *e.g.*, in tree parasite *Armillaria mellea.*

Rhizophore. In many species of Selaginella, a thin forked branch without flowers, going down into the earth and producing roots from the ends.

Rhizopodium. A thin cytoplasmic out-rowth in certain algae that do not have rigid cell walls. Rhizopodial cells are found in Chrysophyta, Xanthophyta and Dinophyta.

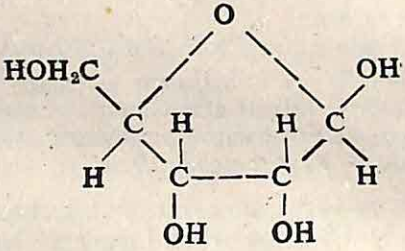
Rhytidome. Bank having both phellem and dead cortex, occurring in some species in which a new phellogen becomes active each year.

Ribofiavin. Vitamin B_2. It occurs in all plant cells, and forms a co-enzyme which takes part in cellular oxidations.

Ribonuclease. The enzyme used for breaking down RNA.

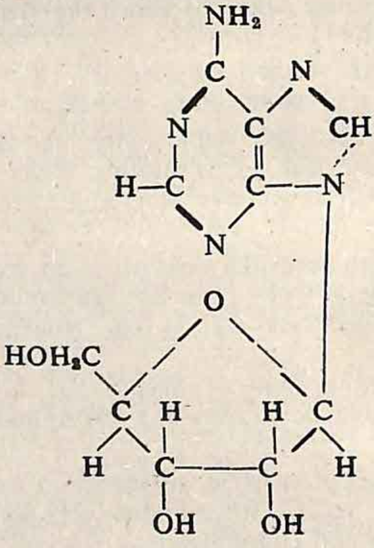
Ribonucleic Acid. It is present on the nucleolus, ribosomes, endoplasmic reticulum and free in the cytoplasm. On the ribosomes and endoplasmic reticulum there is 'messenger' RNA—the template for protein synthesis, and that in the cytoplasm is 'transfer' RNA which helps to transfer amino-acids to the correct site on the 'messenger' RNA.

Ribose. A pentose sugar existing naturally in the furanose form.



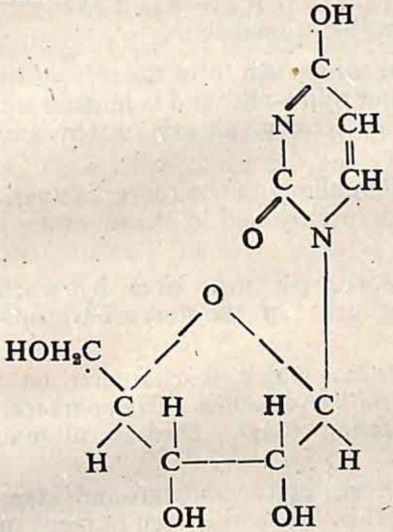
D-Ribofurnose

Ribose-9-Adenonine=Adenosine. A nucleoside having ribose linked to the prurine adenine.



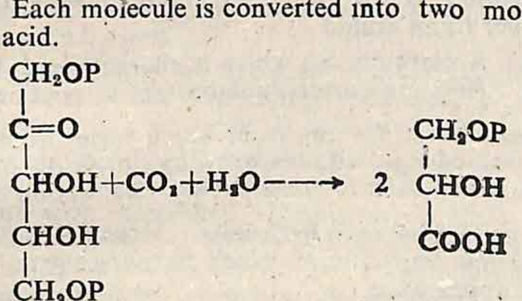
1-β-*D-Ribose-9-adenine*

Ribose-3-Uracil. A nucleoside having ribose linked to the pyrimidine uracil.



Ribosomal RNA (rRNA). A form of RNA which is confined entirely to ribosomes. It is synthesized on nucleolus organizers, base composition remaining same in all the species. After synthesis, rRNA reacts with protein from nucleous forming nucleoprotein and partly constructed ribosome leaves nucleus *via.* nuclear pores and enters the cytoplasm where synthesis gets completed. *Compare* messenger RNA, transfer RNA.

Ribulose Diphosphate. A carbon dioxide receptor during photosynthesis. Each molecule is converted into two molecules of phosphoglyceric acid.



$$\begin{array}{l} \mathrm{CH_2OP} \\ | \\ \mathrm{C{=}O} \\ | \\ \mathrm{CHOH} + \mathrm{CO_2} + \mathrm{H_2O} \longrightarrow 2\ \begin{array}{l} \mathrm{CH_2OP} \\ | \\ \mathrm{CHOH} \\ | \\ \mathrm{COOH} \end{array} \\ | \\ \mathrm{CHOH} \\ | \\ \mathrm{CH_2OP} \end{array}$$

Ribulose diphosphate Phosphoroglyceric acid

Ring Porous. A wood having more vessels, or larger vessels in the spring wood than elsewhere, so that it gets marked in cross section by rings or portions of rings of small holes.

RNA. See *ribonucleic acid.*

Root. Used for the lower portion of axis of a higher plant which is branching and does not have leaves or buds. It anchors the plant in the soil.

Root Cap. A cap of loosely arranged cells covering the apex of the growing point of a root. It protects it as it grows through the soil and is formed from the promeristem.

Root Hair. A tubular outgrowth from the cells of the piliferous layer of a root. It is having thin walls, and is in close contact with the soil particles, so that it can absorb water and dissolved materials.

Root Nodules. Small swelling on the roots of various plants (especially legumes) which are formed by the invasion of nitrogen-fixing bacteria.

Root Pressure. The force per unit area by which aqueous solutions from the living cells in the root are transported to the xylem.

Root Rot. A plant disease which is characterized by disintegration of root tissues. *Armillaria mellea*. *Phytophthora*, *Fusarium* and *corticium* are root-infecting fungi. Disease ultimately causes death of the affected plant.

Rootstock. 1. A short, erect underground stem which is equivalent to a vertical rhizome and is seen in many angiosperms e.g., *Plantago* and certain pteridophytes e.g., *Isoetes*, *Osmunda*. 2. Any underground part of plant. *See* stock.

Root Tuber. A swollen root having reserved food material.

Rosette. (1) A group of leaves which are arising from a short stem, and therefore lying close together on or near the ground.

(2) The 4 cells in the embryo of a pine, that are lying just above the suspensor.

Rostellum. Used for a beak-like outgrowth from the column in the flower of an orchid.

Rot. A plant disease which is characterized by disintegration of tissues. Rots are especially important as post harvest diseases.

Rouge. Used for any plant which varies from rest of the crop and is unwanted *e.g.*, wild oat growing in fields of cultivated oats. This term is also used for removal and destruction of such plants.

Rough Endoplasmic Reticulum. Used for describing cisternae of endoplasmic reticulum on which ribosomes get attached imparting it a rough appearance.

rRNA. *See ribosomal RNA*.

Ruminate. (1) Used for an endosperm into which the inner layer of the testa protrudes.

(2) Used for an endosperm which gets mottled in two or more different colours.

Runcinate. Used for a leaf having a lamina which is composed of lobes with their points pointing backwards.

Runner. A stem running over the earth, putting out roots and forming a new plant at the end of every division.

Russetting. Used for the development of brown, corky patches on certain fruits, especially the varieties of apple, in response to various chemicals.

Rusts. The plant diseases which are caused by fungi of order Uredinales. These diseases are recognized by characteristic streaks of dark pustules on leaves or stems. Some rusts are able to complete their life-cycle on two different hosts (*heteroecious rusts*) where as some on one host only (*autoecious rusts*). Some important rusts are Black stem rusts of cereals (by *Puccinia*), rust of current (by *Cronartium ribicola*).

S

Sac. Any bag-like part or structure.

Saccate. A fruit which has a bag-like envelop around it.

Sac Fungi. Include members of subdivision Ascomycotina that are having septate mycelium (some like *Yeasts* are unicellular). In this division there are about 16,000 species in about 2,000 genera. Sexual reproduction takes place by ascospores, characteristically eight in number in each ascus.

Sagitate. Describing a structure which is shaped like an arrow-head, with two barbs pointing backward, *e.g.*, leaves of sagittaria of dehisced fruits of *triglochin palustris*.

S-allele. A multiple allelic species governing incompatibility reactions in certain plant species. If same S-alleles plant this makes them incompatible with each other. If only one S-allele is shared, plants are semincompatible *i.e.*, half of pollens of one can pollinate the other plant. Incompatible plants are indistinguishable from compatible plants. S-alleles occur in many fruit crops such as *Prunus avium*, in several grasses, clover and in brassicas.

Salt Absorption. Refers to the process of uptake of inorganic ions across semipermeable membranes in plants. This process may be passive (along the concentration gradient) or active (against the concentration gradient). Salt uptake is usually selective.

Salt Marsh. Refers to vegetation in sheltered river estuaries that are subjected to frequent tides and are formed by stablized pioneer communities.

Samara. A dry fruit not cracking open and having a wing-like expansion for transport by wind, generally one seeded, produced by certain trees *e.g., Holoptelia indica.*

Samara Double or Double Samara. A modification of samara which is developing from bicarpellary, syncarpous ovary with pericarp extended into two flat, membranous wings. At maturity, it undergoes division into two, one-seeded parts. Examples are *Acer* or hiptage.

Sample. Refers to a finite series of observations or individuals which are taken at random from the hypothetical infinitely large population of potential observations or individuals.

Sand Binder. A plant holding sand-dunes together by forming a mat of rhizomes and roots.

Sand Culture. Refers to an experimental method which is used for determining the elements required for the healthy growth of a plant, The plants are made to grow in purified sand, and supplied with solutions of known constitution.

Sap. An aqueous solution of mineral salts, sugars and other organic substances, found in the xylem and phloem vessels.

Sap Cavity. A large fluid-filled vacuole present in the middle of an adult cell.

Sapogenin. *See saponin.*

Saponin. Describing any of a class of bitter-tasting glycosides whose aglycone portion (termed *sapogenin*) is a steroid alcohol. These are water soluble and characteristically produce foam. Many are toxic to animals while some find commercial importance in production of steroid hormones, notably diosgen from various species of *Dioscorea.* Function of saponin in plants may serve as predator-deterrents.

Saprobe. Refers to the saprophytic organism when it is a fungus. *See saprophyte.*

Saprophyte. An organism feeding externally digesting the dead organic material thus bringing about the decay. Examples include many fungi and bacteria and find importance in recycling of matter in the ecosystem.

Saprozoic. Feeding on dead or decaying organic material.

Sapwood. Refers to the outer region of the xylem in trees. It contains living cells and functional water-conducting and food-storage tissue.

Sarciniform. Formed in small packets.

Sarcocarp. Refers to the fleshy part of the pericarp of a drupe.

Sarmentose. Having a stem which arises as a small arch from the roots, and then becoming prostrate.

Satellite. A short segment of a chromosome that gets separated from the rest by one long constriction, if terminal, or two if intercalary.

Satellite DNA (highly repetitive DNA). Often about 20 base pair long and usually occurred near the centromere. Its function is not certain.

Savannah. Gross country which is broken by patches of forest or copse.

Saxatilis (Latin). Saxicole, Saxicolous. Growing on rocks or stones.

Scab. Any plant disease which is having conspicuous, raised scab-like lesions that are developed due to the formation of cork layers. Host response to disease has been found to be similar to that of canker but takes place to a lesser degree. Examples include scab of potato by bacterium *Streptomyces scabies* and apple scab by fungus *Venturia inaequalis*.

Scalariform. Anything resembling a ladder as in certain secondary xylem elements having parallel bands of thickening or some performation plates that have pores separated by parallel bars.

Scalariform Conjugation. Refers to a form of conjugation in certain filamentous algae, particularly of Zygnematales, in which two filaments first become parallel to each other and then conjugation tubes arise joining the cells of two filaments that are opposite to each other thereby forming a ladder-like structure.

Scalariform Thickening. Refers to the internal lignification of the wall of a xylem vessel to tracheid that is laid down more or less transversely like the rungs of a ladder.

Scale. (1) Refers to a thin, flat plant member, which may be green when very young, and is usually small.

(2) The hardened, usually non-green bract of a catkin.

Scale Bark. Bark which becomes detached in irregular patches.

Scale Hair. A multicellular flattened hair.

Scale Leaf. A membranous tough leaf, which is generally smaller than the normal leaf, and is usually protective.

Scandens (Latin), Scandent. Describing climbing nature.

Scape. A flower-stalk which is leafless or nearly so. It arises from the middle of a rosette of leaves and bears a flower, several flowers. or a crowded inflorescence.

Scarification. Refers to the process of mechanical abrasion or chemical treatment of the surface of hard seed so as to make it permeable to water and thereby hasten its germination.

Scarious. Anything that is having a dry, membranous appearance but is fairly stiff.

Schizocarp. A dry fruit developed from a syncarpous ovary that splits at maturity into its constituent carpels, which are generally one-seeded.

Schizcotyly. A forking of the cotyledons.

Schizogeny. Refers to the formation of space by separation of cells. *Compare* lysigeny.

Schizont. A vegetative thallus, which lacks wall and undergoes simple or multiple division.

Scion. (1) A portion of a plant that is usually a piece of young stem and is inserted into a rooted stock in grafting.

(2) A young plant that is formed at the end of, or along the course of, a runner.

(3) A stolon.

Sciophyte. A plant showing better growth in lower level of illumination and, therefore, preferring shade.

Sclereid. Refers to a relatively short sclerenchyma cell that is generally formed by thickening (often by lignification) of the wall of a parenchyma cell; simple pits of sclereids are generally more conspicuous than those of fibres. Sclerids often occur as idioblasts in other tiseues.

Scissile. (1) Capable of being split.

(2) Refers to the flesh of a pileus which can be separated into horizontal layers.

Sclerenchyma. Mechanical tissue which consists of cells with thick lignified walls and small lumens. If the cells are elongated, they are termed as *fibres*, and have pointed ends, usually occurring in bundles. When the cells are oval or rounded, they are termed as *sclerides*. These occur singly or in groups.

Sclerosis. The hardening of cell-walls, or tissues, that usually occurs by thickening and lignification.

Sclerotium. (1) Said of a compact mass of fungal hyphae often with a thickened rind. It varies in size from a pin-head to a man's head. They are organs of perennation, and may produce fruit-bodies.

(2) Of Myxomycetes, the firm, resting condition of a plasmodium.

Scorpiod Cyme. A cyme in which the branches are developing alternately to left and right, but are not lying all in one plane. The bud, the axis of the inflorescence is coiled.

Scotophyte. A plant living in the dark.

Scrambler. A plant having long, weak shoots, and growing over and above other plants.

Scutellum. (1) The cotyledon of a grass embryo. It gets flattened and in intimate contact with the endosperm, acting as an absorptive organ.

(2) A shield-like cover, as found in some ascoma.

Sea Weed. Algae that are living in the sea or in close proximity to the sea.

Secondary Cortex. *See phelloderm*.

Secondary Growth. Used for describing the formation increase in diameter of a plant organ which is formed due to of tissues by activity of cambium. Tissues thus formed are called secondary tissues, *tissues*. Such growth takes place mostly in stem and roots and is common in most dicotyledons and gymnosperms and a few monocotyledons.

Secondary Meristem. A region of active cell-division arising from parmanent tissue.

Secondary Mycelium, (1) The mycelium of the binucleate segments that is bearing clamp-connectins and occurred in many Basidiomycetes.

(2) Hyphae growing down from the developing fruit-body of a fungus. They absorb food-material from the substratum.

Secondary Nucleus. The nucleus which is formed in the embryo-sac by the union of two polar nuclei.

Secondary Petiole. The petiole of a leaflet of a compound leaf.

Secondary Phloem. The phloem that is formed by the activity of a cambium.

Secondary Segregation. Refers to the segregation in an allopolyploid of differences between its ultimate diploid parents.

Secondary Spore. Spores, other than basidiospores, that are formed by basidiomycetes.

Secondary Succession. A succession that has arisen after the ground has been cleared of its original vegetation.

Secondary Thickening. Refers to the formation of additional vascular tissue by the activity of a cambium.

Secondary Tissue. Tissue that is formed by secondary thickening.

Secondary Xylem. Refers to the xylem derived from cambium in plants. It shows secondary growth and has two systems : *axial* (vertical) *system* that is derived from fusiform initials of cambium and composed of mainly tracheary elements and fibres and *ray* (horizontal) *system* derived from ray initials of cambium and composed mainly of ray parenchyma forming rays. Secondary xylem is having shorter tracheary elements than the primary xylem and these are arranged in regular rows. Commercial wood is secondary xylem.

Section. (1) A rank in taxonomic hierarchy which is above the rank of series but subordinate to genus. Section name is printed in italics having a capital first letter and is either having same form as generic name or, if a plural adjective, agrees in gender with generic name. Section name gets preceded by abbreviation 'sect' to show its rank *e.g.*, *Chenopodium* sect *Pseudoblitum*.

(2) A thin piece of material which is cut so as to be capable of being examined by a microscope.

Sectorial Chimaera. A chimarea in which a plant consists of two of more types of tissue, which are arranged in cross-section as sectors of a circle.

Seed. A product of a fertilized ovule. It consists of an embryo, enclosed in the testa which is derived from the integumenst(s). Food reserves may or may not be present in the endorperm.

Seed Dressing. Refers to a chemical which is applied to seeds for protection against fungal or insect attack. Chemicals are applied in the form of slurries or concentrated solutions.

Seed Ferns. Include members of Pteridospermales, an extinct order of gymnosperms known from fossil records of Devonian to Triassic period. They possessed fern-like fronds similar to those of fern order Marattiales and their stems showed secondary thickening and plants showed evidence of seed formation. Ovules were present along margins or on surface of megasporophylls that were similar to foliage leaves. Seeds were characteristically radially symmetrical.

Seed Leaf. *See cotyledon*.

Seedless Fruit. Refers to a fruit that is developing without fertilization so that seed does not form in the fruit. *See* parthenocarpy.

Seedling. The young plant which is developing from a germinating seed.

Seedling Blight. Refers to a diseae which is affecting germinated seedlings thereby resulting in slowing of growth and yellowing or wilting of leaves, rotting of roots and lesions at soil level. Casuative fungal organisms include *Pythium*, *phytophthora*, *Rhizoctonia*, *Fusarium* and *Helminthosporium* etc.

Seed Plants. Refers to the member of division Spermatophyta in classifications that are considering seed habit and presence of vascular tissue atleast of equal importance or may be former being more important. Examples include ail seed-bearing vascular plants that are divided into classes Gymnospermae and Angiospermae.

Segmental Allopolyploid. *See allopolyploidy.*

Segmental Interchange. Refers to the exchange of pieces, taking place between two chromosomes which are not homologous.

Segment Half-Cell. Refers to one of the two smaller cells cut off from the pialac cells of most Acrogynae. They ultimately give rise to a 'leaf'.

Segregate. (1) Keep separate.

(2) In taxonomy a group which is based on part of an earlier group.

Segregation. Refers to the separation at meiosis of the members of a pair of allelomorphs.

Segregation Ratio. Refers to the proportion of one type of offspring to another type of offspring taking place as a result of separation of alleles during meiosis.

Seismonasty. Refers to a type of nastic movement which occurs in response to shock as in collapse of leaflets of *Mimosa pudica* after being subjected to shaking or singeing.

Selection Pressure. Refers to the measure of the action of selection in tending to alter the frequency of a gene in a given population.

Selective. The term applicable to herbicides that kill some plants but not others selectively. Broad-leaved plants are usually killed while narrow-leaved plants are unaffected. Such herbicides find use in eliminating unwanted plants from a cereal crop and in lawns.

Selective Absorption. Refers to the ability of a cell, or the cells of an organ, to accumulate a particular ion in a higher concentration in its vacuole, than it is in the surrounding medium ; or alternatively not to accumulate a substance which is present in the surrounding medium, and would normally pass into it by diffusion.

Selective Fertilization. Refers to the fusion of gametes of different sexes in a non-random manner.

Selective Transport. Refers to the preferential movement of a particular ion from one part of a plant to another, so that the ion appears in higher concentration in some parts than others.

Self-Fertilization. The fusion of male and female gametes produced by the same individual.

Self-Pollination. Involves the transfer of pollen from the anther to the stigma of the same flower. More generally it may imply a similar transfer to stigmas on the same plant, or within the same clone.

Self-Sterile. Refers to the inability of gametes of opposite sex, but produced by the same individual, to undergo fusion.

Semantide. Refers to an information-carrying molecule. DNA as carrier of genetic code is called *primary semantide*. RNA as transcription of genetic code is called *secondary semantide* and proteins as translation of genetic code are called *tertiary semantide*.

Semiconservative Replication. Refers to a process by which DNA makes exact copies of itself by involving uncoiling of double-stranded DNA molecule. Separated polynucleotide acts as template and new polynucleotide gets formed on it by complementary nucleotides. Hence the new double-stranded DNA molecule possesses once strand from the original DNA molecule and other strand newly synthesized.

Seminal Root. Any of the adventitious roots growing from the base of the stem during early seeding growth and taking over the function of radicle.

Semipermeable Membrane A membrane which allows the passage of a solvent, but is impermeable to stated dissolved substance.

Senescence. Refers to a period between complete maturity and final death of an organ or organism during which three occurs gradual deterioration in its structure and functioning. It is characterized by accumulation of waste metabolic materials and a decrease in dry weight. Reusable substances are removed from the structure and its respiratory rate increases.

Sensibility. The degree of reaction of a plant which is attacked by a parasite.

Sensitivity. *See sensibility.*

Sepal. One of the parts (lobes) forming the calyx of a flower. It is generally green, and protects the rest of the flower in the bud.

Separation Disk. A bi-concave disk of intercellular material that is found occasionally between the cells of a filament of the blue-green algae. They aid in the break-up of the filament into hormogones.

Separation Layer. *See abscission layer.*

Septicidal. A fruit which opens by the loculi spliting through the middle, and thereby forming several compartments.

Septifragal. Used for describing of the dehiscence of a fruit, when the outer wall breaks away from the walls of the loculi.

Septum. (1) A wall present between two adjoining cells.

(2) A transverse wall present in a fungal hypha, an algal filament, or a spore.

(3) The partition between two loculi of an ovary.

Sequence Hypothesis. A theory postulating how RNA codes the formation of a protein. It is that a particular sequence of nucleotides on the RNA molecule controls the manufacture of a particular amino-acid.

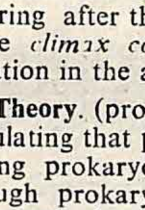
Sequestrol. Refers to a preparation of trace elements which is used to treat deficiency diseases particularly due to lack of iron or magnesium. Elements are chelated for preventing their binding to soil particles and thus promoting their uptake by plant. The preparation having a particular element is named accordingly *e.g.*, sequestering iron.

Sere. Refers to the whole set of communities that are formed during succession in an area and take part in stablization of the area from extreme conditions thereby bringing about climax. It has one *pioneer community* to start the succession, a number of *transitional communities* appearing after the pioneers and replacing each other successively and the *climax community* coming in the last to form the stabilized vegetation in the area.

Serial Endoplasmic Theory. (progressive endosymbiotic theory). Refers to the theory postulating that plastids, mitochondria probably cilia and flagella are having prokaryotic origin and got incorporated into eukaryotic cell through prokaryotic organisms that were living symbiotically within eukaryotic host cell. Plastids are assumed to have originated from organisms like present day bluegreen algae whereas mitochondria from aerobic bacterial organisms.

Series. Refers to a rank in taxonomic hierarchy which is above the rank of species but subordinate to section.

Serine. A water soluble amino-acid in protein.



$$\begin{array}{l} CH_2OH \\ | \\ CH-NH_2 \\ | \\ COOH \end{array}$$

Serology. Refers to a method which is used for identifying microoganisms and viruses, their chemical components, and their relations to one another. One acs as an antigen in blood serum, against which the activities of another can be examined.

Serrate. Used for a toothed margin, when the teeth are pointed, and project forwards.

Sesssile. Refers to a structure that is unstalked such as a leaf with no petiole or stigma with no style.

Seta. 1. Refers to nerve-like extension to a leaf as found in certain species of *Selaginella* 2. Refers to the stalk of sporophyte in bryophytes that is supporting the capsule. It elongates rapidly at maturity for bringing capsule at a height which is suitable for spore dispersal. Seta is often having vascular tissue which enables the sporophyte to obtain nourishment from the parent gametophyte.

Set of Chromosomes. A group of chromosomes having one of each kind contained in the nucleus of a gamete.

Sex, Sexual Differentiation. Refers to the production by an individual or group of individuals, of gametes of two types that are differing in size and mobility (male and female gametes) such that the one type can only undergo fusion with the other type.

Sex Cell. It means gamete.

Sex Ghromosomes. Chromosomes of which there occurs a homologous pair in the nucleus of one sex (the homogametic sex) and a dissimilar pair or only one chromosome, in thôse of the other (the heterogametic sex).

Sex Determination. The process by which a haploid spore or egg, or diploid zygote tends to develop the properties of one or other sex.

Sexine. Refers to the outer layer of exine in a pollen grain.

Sex-Limited Inheritance. Used for the inheritance of a trait that is always restricted to one sex only due to incomplete penetrance rather than allelic differences.

Sex Linkage (sex-linked inheritance). Refers to the tendency of a character to get inherited in one sex more often than in other sex more often than in other sex. It is present in most dioecious plants.

Sex Ratio. The ratio of the males to females in a population at a given time. It is generally expressed as the number of males per 100 females.

Sexual Reproduction. Said of the formation of new individuals of a species by the process which involves the formation of two gametes and development of new indiuidual (s) from the fusion product (zygote). In *autogamy*, two fusing gametes are coming from the same parent while in *allogamy*, they are coming from two different parents.

Shoot. Refers to the part of plant axis which is usually above the ground and bears leaves, buds and reproductive parts. It is developed from the plumule.

Short Day Plants. Used for plants producing flowers only if there is less than twelve hours daylight per day.

Sibs. Used for describing the plants derived by selfing or by crossing between genetically similar parents. Term *sibling species* is used for describing closely related populations having a common ancestry.

Shrub. A woody plant in which the side shoots are well-developed, so that there is no trunk. They are usually less than thirty feet high.

Sieve Area. Said of a limited area on the longitudinal wall of a sieve tude which is perforated by many small pores, through which material may pass.

Sieve Cell. In lower vascular plants and gymnosperms, it refers to a relatively primitive type of vascular cell which translocates sugars and other nutrients. It possesses relatively unspecialized sieve areas than those in sieve tube elements, These are longer and narrower than sieve tube elements,

Sieve Element. A type of vascular cell present in phloem which may be sieve cell or sieve tube element and translocates sugars and nutrients from source to sink.

Sieve Field. One of the perforated areas into which a sieve-plate may be divided by a net-work of thick strands of wall material

Sieve Plate. *See Sieve tube.*

Sieve Tube. A characteristic element of phloem which serves to translocate food materials synthesized into plant. The cells are living, thin-walled and in longitudinal rows. They are connected by perforations in their transverse walls, through which pass strands of cytoplasm. The perforated walls are known as *sieve-plates.* Sieve areas may be present in the longitudinal walls.

Sieve Tube Element. Refers to the relatively advanced vascular cell present in phloem of angiosperms. It is characterized by presence of a sieve plate, a non-lignified secondary wall and a living enucleated protoplast. These elements join together thereby forming a sieve tube. End wall of each element in the tube gets modified to form sieve plate. These elements are usually having specialized parenchyma cells (companion cells) associated with them and protoplast of companion cell is connected to that of sieve tube element.

Silicle. *See silicula.*

Silicula (silicle). Refers to a dry, dehiscent fruit that is similar to siliqua (*see* siliqua) in characters except that it is having equal length and breadth and is broad and flattened as in *Capsella*.

Siliqua. Refers to a dry, dehiscent fruit that is developed from bicarpellary, syncarpous; supperior ovary having parietal placentation and one locule inifially but becoming bilocular later due to formation of false septum. Each locule is having many seeds. At maturity pericarp dehisces into two valves, starting from lower end towards 'upper end. In the middle, replum remains (*See* replum). Such fruits are common in Cruciferae.

Silt. Describing a mineral particle in soil having diameter of 0.002-0.25 mm. *See* soil texture.

Silurian. A geological period which is 340-310 million years ago.

Simple Fruit. A fruit that is formed from one overy.

Simple Leaf. A leaf having the lamina in one piece. It may be lobed, but the lobes never reach the mid-rib.

Simple Pit. A pit that is not having border. For example, it is found in certain parenchyma cells, extraxylary fibres and sclerieds. *Campare* bordered pit.

Simple Sorus. A sorus having one sporangium.

Simple Tissue. A tissue made up of cells all of the same kind.

Simple Umbel. An umbel in which the flower-stalks are arising directly from the top of the main stalk.

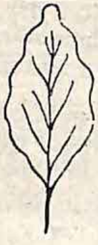
Single Cell Protein (SCP). A protein which is produced by unicellular organisms for animal and human consumption. Much research is being done to develop suitable industrial plants for large scale culture of certain bacteria, fungi and algae and many products are available *e.g.*, Pruteen.

Single Factor Inheritance. Said of the determination of a character by one factor which may exist in various allelic forms. Mendelian factors and inheritance are examples of single factor inheritance.

Sink. Used for describing a site within an organism or cell where a particular substrate or catalyst is being utilized. For example, mitochondria act sink for oxygen and chloroplasts for carbon dioxide.

Sinuate. (1) Referring to the margin divided into wide irregular teeth or lobes, which are segarated by shallow notches.

(2) Refers to the gills of agarics which curve suddenly on reaching the stipe.



sinuate

Siphonostele. A stele having the xylem and phloem arranged in the form of concentric cylinders around a central pith. It is *ectophloic* if the xylem is nearest the pith, and *amphiphloic* if the phloem is nearest the pith.

Skotophile. *See photophobe.*

Sliding Growth. Refers to the movement of developing tracheids and vessels along their mutually touching longitudinal walls as the cells elongate.

Slime Bacteria. Refers to the members of order Myxobacteriales that are flexible and creeping in habit. They do not have rigid cell wall and flagella. However, they are moving by gliding across the substrate. Most members are terrestrial and differ from other bacteria in producing resting cells called *microcysts* that are usually borne in fruiting bodies. Many are soil saprophytes.

Slime Flux. Refers to an exudation of a watery solution of sugars and other substances from trees which are wounded, or attacked by parasities.

Slime Moulds. Including members of class Myxomycota that are fungus-like. They consist of naked mass of protoplast called *plasmodium*. In this class there are about 500 species of about 70 genera and usually occurred on decaying vegetation. Various forms in life-cycle (*See* swarm cell, myxamoeba, plasmodium) show characteristics of animals, notably ingestion of solid food.

Smooth Endoplasmic Reticulum. Said of endoplasmic reticulum on which no ribosomes get attached giving it smooth appearance.

Smuts. Refer to the diseases of plants that are caused by members of fungal order Ustilaginales that are producing characteristic masses of black spores usually on the host. In covered smuts (*e.g.*, covered smut of barley by *Ustilago hordei*), mature spore mass is left within the sorus for sometime, often until sorus gets liberated from the host. In loose smuts (*e.g.*, loose smut of wheat by *U. nuda*), spores are uncovered and form mass of black powder. This term is also used sometimes for describing fungi that cause the smut disease.

Society. Refers to a minor community within a consociation. It arises as a result of local variation in the environment, and dominated by species other than the consociation dominant.

Soft Rot. A disease which is caused by fungi or bacteria in which tissues of affected plant become soft. Diseases are most often caused in stored fruits and vegetables by fungus *Rhizopus* and bacterium *Erwinia*, especially in humid and badly ventilated conditions.

Softwood. *See secondary xylem.*

Soil. Refers to the superficial layer of materials which is covering earth crust. It denotes the natural medium in which plants anchor and from which they derive water and nutrients. Soil is having soil minerals derived from weathering of rocks, soil organic matter derived from death. decay and decomposition of living matter, soil water and soil air. Various soil microorganisms occur in the soil.

Soil-Borne Diseases. Refer to any plant disease that originates from inoculum in the soil *e.g.*, damping-off and club root. Their control is difficult.

Soil Profile. Refers to the arrangement of horizontal layers as observed in the vertical section of the soil body at a place. The layers are called *soil horizons* which are different in thickness, colour, texture and composion in different soil types.

Soil Structure. Refers to the shape and arrangement of large soil aggregates in the soil. Mineral particles in soil form large units called *peds* which may be having different shapes such as *cubical*, *spherical*, *columnar*, *prismatic*, *laminar* and *granular*. The shape and size of peds and their arrangement decide the pore space in the soil and thus ascertain the amount of soil water and soil air.

Soil Texture. Defining the roughness of soil which is decided on the basis of relative proportions of different sized mineral particles in it. A soil which is having atleast 85% sand and not more than 10% clay, remaining being silt is called *sandy soil*; which is having more than 80% silt and less than 12% clay, rest being sand is called *silt soil* (*loam*); and which is having 60-80% clay, 10-15% sand and rest being silt is called *clay soil*. There are some various intermediate categories also. Soil texture helps to know the soil water, soil aeration, water holding capacity, capillarity etc. in the soil. Ploughing, harrowing and rolling are known to alter soil texture to some extent by altering the soil structure.

Solarization. Refers to the temporary stopping of photosynthesis in a leaf which has been exposed to strong light for a long time.

Solenostele. Refers to the vascular tissue in plant in which the phloem lies on both sides of the xylem.

Solonchak. A saline soil which is developed under hot, dry conditions, where the salts accumulate near the surface.

Solonetz. Refers to solonchak which has been leached of its salt, so that the surface exchangable ions are not sodium, but calcium or magnesium.

Solution Potential. *See osmotic potential*

Somatic. Used for describing all parts of a plant, except the germ mother-cells and gametes.

Somatic Apogamy. Refers to the development of the sporophyte from the tissues of a gemetophyte, without involving the fusion of nuclei. It therefore has the same chromosome number as the gametophyte.

Somatic Cell. Refers to any cell of the vegetative body of the organism other than reproductive cell *i.e.*, spore, gamete or their precursors.

Somatic Hybridization. Refers to the production of cells, tissues or organisms by involving fusion of non-gametic nuclei. It is possible to induce the phenomenon under laboratory conditions in cells that normally never fuse together and finds use in plant breeding or genetics. It may also occur naturally, especially in fungi.

Somatic Mitosis. The division of a metabolic nucleus.

Somatic Mutation. A mutation in a somatic cell, rather than in a germ-cell.

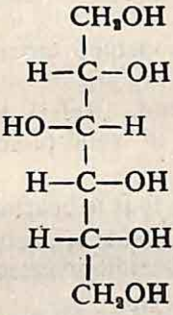
Somatic Segregation. Refers to the formatian, by mitosis of cells differing from one another, either through mutation, or by somatic crossing-over in the nucleus, or by an unequal assortment of cytoplasmic determinants.

Somatotropism. Refers to a directed growth movement in a plant so that the members come to be placed in a definite position in relation to the substratum.

Soralium. A group of soredia that are surrounded by a distinct margin formed from the thallus of a lichen.

Soral Membrane. The wall which is surrounding the sorus in some lower fungi.

Sorbitol. The sugar alcohol of glucose.



$$\begin{array}{c} CH_2OH \\ | \\ H-C-OH \\ | \\ HO-C-H \\ | \\ H-C-OH \\ | \\ H-C-OH \\ | \\ CH_2OH \end{array}$$

D-Sorbitol

Soredium. Refers to an organ of vegetative reproduction of lichens. One or more algal cells are enclosed in hyphae. This small body gets detached and gives rise to a new thallus.

Soriferous. Bearing sori.

Sorocarp. The fruiting structure of the Acrasiales.

Sorophore. The sorus-stalk.

Sorosis. A fleshy fruit that is formed from a number of crowded flowers, *e.g.* a pineapple.

Sorosphere. A hollow ball of spores which is formed by some of the lower plants.

Sorus. (1) A group of fern sporangia.

(2) A powdery mass of soredia formed on the surface of a lichen thallus.

(3) A fruiting structure in certain fungi, especially the spore-mass of rusts and smuts.

(4) A group of fruit-bodies found in the Synchytriaceae.

Spadix. A spike of flowers having a fleshy axis, enclosed in a spathe.

Spathe. Refers to a large bract that encloses a spadix and may be highly coloured and petaloid as in *Anthurium* and in such case, helps in insect pollination.

Spatulate (spathalate). Refers to the structures that are having a broad apex and a long, narrow base *e.g.*, leaves of *Bellis perennis.*

Special Creation. *See creationism.*

Speciation. Referring to the natural process of creation of new species. Various theories about the mechanism have been postulated which are mainly involving establishment of reproductive barriers, natural selection and progressive differentiation in the population.

Species. Refers to the smallest unit of classification commonly used In sexually reproducting organisms it represents a maximum interbreeding, or potentially interbreeding group, breeding true within its own limits in nature.

Specific Characters. The constant characteristic by which a species could be distinguished.

Specific Conductivity of Wood. Refers to the rate at which water is flowing through a piece of wood of standard cross-sectional area in a stated length of time.

Spermatiophore. A hypha that is bearing a spermatium.

Spermatium. A non-motile male sex-cell that is present in red algae, in some ascomycetes and basidiomycetes, and some lichens.

Spermatocyte. *See antherocyte..*

Spermatozoid. *See antherozoid*

Sperm Cell. Refer to any of two male gametes formed from body cell by mitotic division in the pollen tube of gymnosperms. In some species (*e g., Cycas* and *Ginkgo*), they are flagellate whereas in others *e.g.*, Gnetales and Coniferales, they are non-motile. The term is sometimes applicable to generative cell.

Spermogone, Spermogonium. Of fungi, a flask-shaped, or flattened hollow, structure in which spermatia are formed.

Sphaeroraphide. *See druse.*

S-Phase. Refers to the period during cell division when DNA replication and histone synthesis occur as chromosomes undergo division into chromatids.

Sphaerosomes. Said of an organelle that is 0.5-1.0 μm in diameter, having single membrane and fairly regular matrix having triglycerides. These occur in cells in which lipids are stored and they have hydrolytic enzyme lipase, probably playing a role in mobilization of stored lipids when needed in cell metabolism.

Sphingolipid. A type of complex lipid having long-chain amino acid alcohol e.g.. sphingosine. It is joined by an amide linkage to a long-chain fatty acid. It is important as membrane components in both animal and plant cells. In yeasts and higher plants, amino alcohol is usually phytosphingosine.

Spike. Refers to a racemose inflourescence in which flowers are sessile and are brone on an elongated axis as in wheat.

Spikelet. One of the units of the inflorescence of a grass. It is having a central rachis which is bearing one or more sterile glumes at the base, followed by one or more flowers. each enclosed between a flowering glume and palea. All the parts become crowded together.

Spindle. The axially differentiated crystalline ('fibrous') part of the cytoplasm within which there occurs the orientations of the centromeres of the chromosomes during metaphase and anaphase. It is composed of longitudinally orientated protein molecules. Movement of the chromatids apart during anaphase may occur due to pulling by contractile fibres in the spindle.

Spindle Attachment. Refers to the position of the centromere.

Spindle Fibre. The orientated protein molecules of the spindle.

Spine. The end of a branch or leaf which has become rounded in section, and is hard and sharply pointed.

Spiral. Refers to a coil of the chromosome, chromatid, or chromosome-thread a mitosis or meiosis.

Spiral Cell. Spiral Tracheid(E), spiral Vessel. Used for the cell, tracheid(e), or vessel in which the secondary wall is laid down in the form of spirally arranged thickened.

Spiral Thickening (helical thickening). Refers to a type of secondary wall patterning found in tracheary elements in which secondary wall has been laid down in a helical pattern. This pattern, like annular thickening, permits further elongation of cell and therefore, occurs in tissues such as protoxylem which develop in young organs and continue elongation.

Spirillium. Cork-screw shaped bacterium, some of which are motile having terminal flagella.

Splint Wood. Wood in which the living cells have been scattered throughout.

Spodogram. Refers to the preparation of the ash of a portion of a plant, especially a woody portion, used in investigation of structure.

Spongioplasm. Describing the more viscid constituents of cytoplasm, forming a threadwork.

Spongy Layer, Spongy Mesophyll, Spongy Parenchyma, Spongy Tissue. A loosely constructed layer of irregularly shaped cells which are separated by large intercellular spaces. It lies just above the lower epidermis of a dorsiventral leaf and has chloroplasts.

Spontaneous Generation. A theory which postulates that living organisms are generated spontaneously and directly from non-living matter. Theory was conclusively disproved in 1862 by Louis Pasteur. The theory is different from the theory of abiogenesis and origin of life.

Sporangiophore. Of fungi, hyphae bearing one or more sporangia, sometimes, morphologically distinct from vegetative hyphae.

Sporangiospore. A spore, especially a non-motile spore which is formed within a sporangium.

Sporangium. The structure having asexual spores.

Spore. An asexual reproductive body that may be unicellular or multicellular, and produced by haploid or diploid generations. Spore production is a phase in a life-cycle which is inserted between two sexual phases (if present).

Spore Membrane, Spore Wall. The firm membrane which is surrounding contents of a spore.

Spore Mother Cell. A diploid cell giving rise to four haploid spores by meiosis.

Sporocarp. (1) A fruit-body of the fungi.

(2) A multi-cellular structure in which spores are found.

(3) A spore containing structure of the Marsiliaceae and Salviniace.

Sporocpst. A cyst producing asexual spores.

Sporocyte. A spore mother-cell.

Sporogenesis. Describing the process by which spores are formed. Process of formation of microspores and megaspores are known as microsporogenesis and *megasporogenesis* respectively.

Sporophore. Of fungi, a general term used for any structuture producing and bearing spores,

Sporophyll.' A leaf bearing sporangia. It may resemble an ordinary leaf, except for the sporangia, *e.g.* in the ferns, or it may be highly modified, *e.g.* the stamens and carpels of flowering plants.

Sporophyte. An individual of the diploid generation of plants that is usually producing spores, and is formed by the union of sexual cells produced by the gametophyte.

Sporoplasm. The spore-producing protoplasm within the epiplasm of a sporanium or ascus.

Sport. Used for an atypical form of an individual, due to mutation or segregation. This term is usually restricted to new forms and is most commonly used in horticulture.

Spur. **(Sort Sdoot)**. (1) A short branch on which flowers and fruits are brone.

(2) The extension of the base of a leaf beyond its point of attachment.

(3) A hollow horn-like extension of a petal, or gamopetallous corolla.

Spurious Dissepiment (False Septum). A partition in a fruit which is neither an ingrowth from the edges of the carpels, nor an upgrowth from the receptacle.

Spurious Fruit. A group of fruits which are having the appearance of a single fruit.

Spur Pelory. Represents abnormal condition in which all the petals of an irregular flowers develop spurs, so that the flower becomes regular.

Stachyose. Refers to a non-reducing tetrasaccharide which is made up of two galactose and one unit each of glucose and fructose. It occurs in many members of Labiatae, especially the tubes of *Stachys tuberifera* and in some leguminous plants.

Stalk Cell. Refers to one of the two cells that are formed by division of generative cell in male gametophyte of certain gymnosperms.

Stamen. A male repreductive organ in angiosperms, morphologically it is a highly specialized microsporophyll that is differentiated into a filament, anther and connective tissue.

Staminate. Having stamens, but no carpels.

Staminode. An abortive stamen. It may be highly modified or reduced.

Staminose. Refers to a flower in which the stamens are very obvious.

Standard. Used for the large petal which stands up at the back of the flower of the Papilionaceae.

Starch. Represents polysaccharide with the general formula $(C_6H_{10}O_5)_n$, where n is large. It is obtained by the condensation of glucose units and is a storage substance in many plants. It does not reduce Fehling's solution, but gives a blue-black compound with iodine solution.

Starch Crescent. A stand of cell which is crescentric in cross-section and is containing starch grains.

Starch Sheath. (1) A one-layered cylinder of cells present on the inner boundary of the cortex of a young stem having prominent starch grains in the cells. It is homologous with an endodermis.

(2) A layer of starch grains present around the pyrenoid in an algal cell.

Starch-Statolith Hypothesis. A hypothesis which attempts to explain the possible method by which plants perceive gravity. Most gravity sensitive organs have specialized cells called *statolith* that gradually fall to the lower side of cell under the effect of gravity. This setting out of these grains in reoriented cells gives internal stimulus which is transmitted to the growing region of organ to amend the growth pattern.

Statocyte. Any cell sensitive to gravity and has statoliths.

Statolith. Refers to a solid inclusion in a plant cell (often a starch grain). It is free to move under the influence of gravity. It may be the means where by position in respect to gravity influences a plant organ.

Stele. (vascular cylinder). Refers to the central core of stems and roots of vascular plants that are comprising of vascular tissue, such as pitch, medullary rays and the pericycle. Pericycle forms the outermost layer of stele. The various types of stele are shown in Fig.

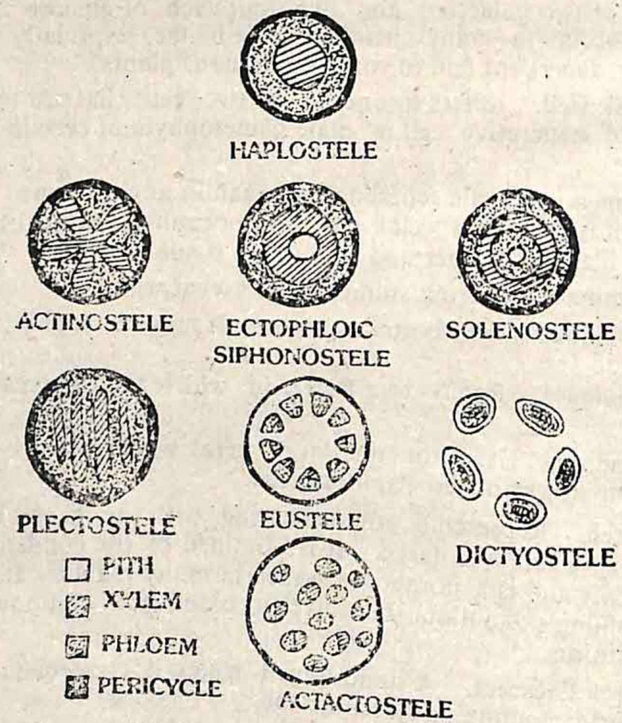


Fig. 30. Various types of Steles.

Stem. Refers to the axis of a plant that is bearing leaves with buds in their axils. It may be above or below ground, and the leaves may be functional or scales. The vascular bundles are arranged in a circle thereby forming a hollow cyclinder, or are scattered.

Stem Body. The part of a spindle between two groups of chromosomes separating at anaphase.

Stem Succulent. A plant having a succulent stem and very small leaves which are often reduced to spines.

Stem Tendril. A tendril which is a modified stem.

Stem Xerophyte. Refers to a plant characteristic of very dry places, with ephemeral or very reduced leaves. The photosynthetic tissue is present in the peripheral layers of the stem.

Steppe. A dry grassy plain.

Sterigma. Of fungi, a minute stalk, bearing a spore or chain of spores.

Sterile. (1) Unable to reproduce sexually.

(2) Free from living microorganisms.

Sterile Cell. The terminal cell in a chain of aecidiospores.

Sterile Flower. Refers to a staminate flower.

Steroids. Refer to the saturated hydrocarbons having 17 carbon atoms in a system of rings 3 six-membered and 1 five-membered, condensed together (six atoms being shared between rings).

Sterols. These are compounds having the general chemical ring-structure of a steroid, but with a long side-chain and an alcohol group. Those found in plants (*phytosterols*) are oxidation products of cholesterol ($C_{27}H_{45}OH$).

Stichonematic. A flagellum having mastigonemes on one side of main axis of flagellum. *Compare* pantonematic, acronematic.

Stigma. Tip of carpel receiving pollens during pollination. It is having different shapes in different plants and is adapted to trap pollens. In certain plants, they exhibit haptotropic movements. Stigmas are also involved in complex pollen-stigma compatibility reactions.

Stilt Root. An adventitious root that is formed by a stem from a point above ground level passing downwards into the soil and imparting support to the plant.

Stimulus. Refers to any change in the environment of an organism or of part of it which is intense enough for producing a change in the activities of the living material, without itself providing energy for the new activities.

Stinking Smut. *See bunt.*

Stipe. A stalk especially the part of the thallus of certain brown algae *e.g.*, *Laminaria* joining the lamina to the holdfast.

Stipules. Refer to basal appendages of a leaf or petiole. They may photosynthesize, or be scales, and may protect the axillary buds.

Stirps. A well-established variety that keeps its characters in cultivation.

Stock. (1) An artificial mating group.

(2) A rooted stem into which a scion is inserted during grafting.

(3) A perennial portion of a herbaceous perennial.

(4) A race.

Stolon. (1) A horizontally growing stem bearing adventitious roots at the nodes, and scale leaves. New plants or tubers may develop terminally.

(2) A long hypha that is lying on the substratum and producing tufts of rhizoids and sporangiophores at intervals.

Stoma. (1) A pore in the epidermis of plants which is present in large numbers, particularly on leaves, through which gaseous exchange occurs. Each stoma has been surrounded by the sausage-shaped guard cells which open and close the stoma by changes in their turgidity.

(2) It may be used to include the pore and guard cells.

Stomatopodium, Stomopodium. A hyphal branch or 'plug', above or in a stoma.

Stomium. Refers to the place in the wall of a fern sporangium whose repture takes place at maturity, releasing the spores. It has thinwalled cells.

Stone. Refers to the hard endocarp of a drupe.

Stone-Cell. A thick-walled cell, not much longer than broad, having lignified walls.

Stone Fruit. A drupe.

Stool. A plant from which off-sets may be taken, or with several stems arising together.

Storied. The axial cells and rays of wood that are arranged in horizontal layers as viewed in tangential section.

Strain. (1) A natural or artificial mating group that is uniform in some particular property.

(2) A variety of species, having distinct morpholiogical and/or physiological characters.

Stratification. 1. Refers to the arrangement of some factor in horizontal layers *e.g.*, temperature and light intensity in an aqueous ecosystem or layers in vegetation due to plants of different heights. 2. Refers to the practice of placing seeds between layers of moist sand or peat and exposing them to low temperatures just by leaving them outside during the winter. This treatment is necessary for seeds that are requiring chilling period before germination.

Strengthening Tissue. *See mechanical tissue.*

Strobilus (cone). 1. Refers to the structure having distinct, closely packed sporophylls (bearing sporangia) that are arranged around a central axis and produced usually at the apex of a branch as found in gymnosperms and in certain lower plants. 2. Refers to any of the cone-like structures in angiosperms *e.g.*, aggregate fruits of *Alnus* and *Humulus*.

Stroma. (1) A tissue-like mass of fungal hyphae in, or from which fruit-bodies are produced.

(2) The zone between the intergranum lamellae of a chloroplast.

Stroma Starch. Starch produced in the stroma of a chloroplast when photosynthesis is active.

Stromatolites. Refers to the structures which are formed and preserved in many rocks, especially carboniferous rocks that were formed by activities of algae and among the oldest organic structures recognized. They occur in gunflint chert of Ontario (about 2,000 million years old) and Precambrian rocks of Australia and Africa (about 3,000 million years old) and often consist of white concentric rings having outer ones upto a metre across.

Structural Gene. A length of DNA coding for an enzyme or other protein, equivalent to a cistron. *See also* regulator gene, operator gene, operon.

Style. The narrow part of the gynoecium which bears the stigma.

Sub-Climax. A community having not attained the full development possible under the prevailing conditions due to some limitations imposed by an edaphic or biotic factor.

Sub-Culture. A culture of bacteria or fungi which is prepared from a pre-existing culture.

Suberin. A complex mixture of oxidation and condensation products of fatty acids which are present in the walls of cork-cells, thereby rendering them impervious to water.

Suberin Lamelia. A layer of wall material which is impregnated with suberin.

Subicle, Subiculum. A felted or cottony mass of hyphae which may be underlying the fruit-body of some fungi.

Sub-Littoral. Growing near the sea, but not on the shore. Growing below the low water level.

Subsere. Refers to the stages in the development of climax vegetation during secondary succession in an area.

Subsidiary Cell (accessory cell). Refers to one of the group of morphologically differentiated epidermal cells that are immediately sorrounding the guard cells. Stomatal complexes lacking subsidiary cells are known as *anomocytic*. Number, arrangement and method of development of subsidiary cells are having taxonomic value.

Subsoil. The matter present in C-horizon in the soil.

Sub-Species. A sub-division of a species, larger than a race.

Substrate. (1) The substance on which an enzyme acts.

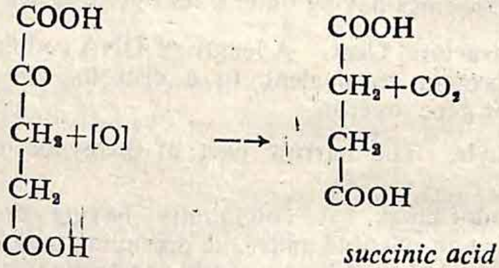
(2) The medium on which a fungus and bacteria (or other plant) grow, especially in culture.

(3) The solid object to which a plant gets attached, *e.g.*, a seaweed.

Subulate. Refers to the structure which is shaped like an awl *i.e.*, narrow pointed and more or less flattened *e.g.*, leaves of *Sunularia aquatica.*

Succession. Refers to the progressive change occurring in the composition of a plant population during development of vegetation, from initial colonization to the attainment of the climax.

Succinic Acid. The acid formed from α-ketoglutaric acid, in the citric acid cycle, by oxidation of CO to CO_2.



$$\begin{array}{c} COOH \\ | \\ CO \\ | \\ CH_2 + [O] \\ | \\ CH_2 \\ | \\ COOH \end{array} \longrightarrow \begin{array}{c} COOH \\ | \\ CH_2 + CO_2 \\ | \\ CH_2 \\ | \\ COOH \end{array}$$

succinic acid

Succinic Dehydrogenase. An enzyme catalysing the oxidation of succinic acid.

Succubous. Having the lower edge of the leaf in front of the stem and overlapping the upper edge of the next leaf below it, on the same side of the stem.

Succulent. (1) Juicy, soft and thick.

(2) A xerophyte that stores water in the tissue, giving it a fleshy appearance.

Sucker. (1) A shoot that is arising below ground.

(2) A new shoot on an old stem.

(3) The modified root of a parasite, by which it absorbs materials from the host.

Sucrase. An enzyme catalysing the hydrolysis of sucrose.

Sucrose. Cane sugar, a disaccharide compound composed of glucose and fructose.

Suction Pressure. When referred to a cell, it refers to the force which is available for taking in water. It is equal to the osmotic pressure of the cell-sap (OP), less the inward pressure of the cell-wall (WP) and the osmotic pressure of the surrounding medium (OPM), which is zero if the cell is in pure water. SP = OP − WP − OPM.

Suffrutescent, Suffruiticose. Used for a plant in which many of the branches die after flowering, thus leaving a persistent woody base.

Suffrutescent Habit. A growth form in which plant is woody at the base but is having herbaceous branches as seen in alpine willows.

Sugar. Refers to any of the low molecular weight carbohydrates namely monosaccharides, smaller oligosaccharides and derivatives of these.

Sugar Acid. Refers to an oxidized derivative of a monosaccharide. Biologically important sugar acids are of two types: *aldonic acids* having aldehyde group of a monosaccharide oxidized to a carboxylic acid and *uronic acids*.

Sugar Alcohol. Refers to a monosaccharide in which aldehyde group gets reduced to an alcohol. Sugar alcohols other than glycerol occur only in plants. Examples are sorbitol from D-glucose, mannitol from mannose etc.

Sugar Phosphate. Refers to phosphate derivatives of monosaccharide, that are importatant intermediates in carbohydrate metabolism *e.g.*, CO_2 acceptor in Calvin cycle ribulose 1, 5 biphosphate.

Sulphur Bacteria. Bacteria living in situations where oxygen is scarce or absent; and which act on sulphur compounds releasing the element.

Super Gene. A group of genes that are acting as a mechanical unit in particular allelomorphic combinations.

Superior Ovary. *See ovary.*

Supernumerary Chromosome. *See B-chromosome.*

Supperssive. Used for a plasmagene which suppresses the expression of an alternative condition in a particular respect in a hybrid individual and its descendants.

Suppressor. A gene, one of whose allelomorphs renders indetectable the difference determined by the allelomorphs of another gene.

Surface Area/Volume Ratio. Refers to the ratio of the surface area of a cell, organ or organism to its internal volume. The ratio directly relates to the possibility of gaseous exchange and absorption of dissolved mineral. Hence size of unicellular organisms is limited by the rate of gaseous exchange from surroundings whereas in higher plants leaves and intercellular space results in a much higher ratio.

Susceptibility. The whole properties of a plant, which dispose it to be attacked by a parasite.

Suspended Placentation. *See apical placentation.*

Suspension Culture. Refers to the system of single cells and small cell aggregates in a liquid growth medium which is kept agitated by bubbling, shaking or stirring to prevent settling of cells.

Suspensor. (1) A cell that is supporting the gametangium of the Mucorales.

(2) A structure that is developing with the embryo of seed plants and some pteridophytes, elongating and pushing the embryo into the nutritive endosperm or prothallus.

Svedberg Unit. *See sedimentation co-fficient.*

Swamp. Refers to a region of stagnant or slow-flowering water having vegetation of reeds, sedges and yellow flagi iris etc. It is formed around lake margins, on water retentive clays in desert and semidesert areas. Mangroove swamps are formed along tropical coasts having vegetation of halophytes,

Swarm-Cell. Of myxomycetes, and some Chytridiales, a motile cell acting, before and after division, as an isogamete.

Switch Plant. A plant having small leaves, often reduced to non-functional scales, and long thin stems and branches, with photosynthetic tissue in their cortical regions.

Syconium, Syconus. The fruit of a fig, which consists mainly of the much- enlarged receptacle of the inflorescence.

Symbiosis, Used for describing a type of mutualism that is taking place between two organisms of different types in which both the interacting organisms mutually benefit each other and generally live in harmony with each other e.g., relationship existing between algae and fungus in a lichen thallus or between *Rhizobium* bacterium and leguminous plant.

Sympatric. Used for describing two or more populations that can interbreed but usually do not do so because of various differences e.g., different flowering times, different pollinators etc. Such population may become so distinct so as to form separate species due to natural selection.

Sympetalous. *See gamopetalous.*

Symplast. Refers to the continum of cell protoplast throughout the plant linked by plasmodesmata. As it is offering far greater resistance to water flow than the apoplast, it is only a secondary route for water movement.

Symplastic Growth. Refers to a type of growth in which adjacent cells grow at the same rate so that the symplast does not get disrupted.

Symplesiomorphy. *See cladistics.*

Sympodial Branching. Refers to a type of growth in some plants e.g., elm and lime, in which apical bud is withering at the end of growing season and lateral buds immediately below it continue the growth in the next season.

Sympodium. A composite axis which is produced and increased in length by successive development of lateral buds, just behind the apex. The main axis stops growing.

Synandrium. A mass of united anthers.

Synandrous. Having several united stamens.

Synangium. A compound structure which is formed by the lateral fusion of sporangia. It is found in certain ferns.

Synapsis. Refers to the pairing of homologues during prophase I of meiosis. Pairing is very exact process which starts from centromeres and continues with pairing of chromosomes at various points along the length of homologues. Contraction of chromosomes continues during the pairing and chromosomes become closely coiled around each other to form bivalents. Nature of forces causing pairing of homologues is not clearly understood.

Syncarpous. Refers to a gynoecium in which two or more carpels get fused and the degree of fusion varies in different species. The gynoecium, that is joined only at the base of ovary (*e.g.*, in Labiatae) is known as *semicarpous*, that is joined from ovary to style is known as *synstylovarious* (found in Caryophyllaceae) and that is joined from ovary to stigma is known as *syncarpaus* (*e.g.*, in Cruciferae).

Syndesis. In meiotic nuclear division, the fusion of homologous chromosomes.

Syndetocheilic. Refers to gymnosperm stomatal complex in which subsidiary cells and guard cells are derived from the same initial cell *e.g.*, in Bennettitales.

Syndiploidy. Doubling ; the fusion of sister nuclei to yield a doubled chromosome number, particularly in the divisions immediately preceding meiosis.

Syndrome. A group of symtoms which are characteristic of the same infection or abnormal genetic condition, but not necessarily all appearing together.

Synecology. Refers to the study of plant communities.

Synergidae, Synergids. The two cells, which, together with the egg nucleus form the egg apparatus of the embryo sac of flowering plants.

Synergism. (1) The combined activities of agencies such as drugs, hormones etc. which separately influence a reaction in the same direction, such that the effect produced is greater than the sum of effects of each agent acting alone.

(2) A similar effect which is brought about by two organisms.

Syngamy. The fusion of gametes.

Syngenesious. Refers to an androecium in which anthers get fused but filaments are free as in Compositae.

Syntype. Any one of two or more specimens of other material (descriptions, illustrations etc.) designated by an author in the original publication of the name of a taxon. As a taxon can have only one type, a lectotype is subsequently chosen from a group of syntypes for serving as the nomenclatural type.

Systematics. Refers to the study of the classification of living things, laying emphasis on their evolutionary relationships.

Systemic (translocated). Refers to a chemical which is absorbed by a plant and translocated throughout the tissues *e.g.*, systemic fungicides and insecticides.

T

Tachysporous. Of a plant, freeing its seeds quickly.

Tachytelic. Term used in chronistics to describe that which from fossil evidence has evolved very rapidly.

Tactic Movement. *See taxis.*

Taiga. A wet wood land of siberia.

Take-All. A disease of grasses and cereals which is caused by fungus *Gaeumannomyces* (*Ophiobolus*) *graminis*. The pathogen survives in soil on crop debris and infects crops at any stage.

Tangential Longitudinal Section. Describing a section through a plant member parallel to a tangent to its surface.

Tannins. A group of complex compounds having phenols, hydroxy-acids or glucosides.

Tannin Sac. A cell having much tannin.

Tapetal Plasmodium. A multinucleate mass which is formed by the breakdown of the cell walls present between the cells of the tapetum.

Tapetum. A food rich layer of cells which is present around a group of spore-mother-cells in vascular plants. They get disintegrated to liberate the contents which get absorbed by the developing spores.

Tap Root. The robust primary root which is developed from radicle of embryo that persists. It is generally penetrating some depth below the ground level and sometimes modified as a storage organ. An example is *Daucus carota* (carrot).

Tautonym. A specific or intraspecific name that has exactly repeated the generic name *e.g.*, *Magnolia magnolia*. Such names are not permitted in botanical nomenclatural code but are allowed in zoology.

Taxis (tactic movement, pl. taxes). Used for the free, directional, locomotor movement shown by whole organism that alters its physical position in response to external stimulus. In plants, such movements are exhibited by small unicellular organisms that are living in aquatic habitat e.g., *Euglena* moves by using flagellum and by certain reproductive cells and bacteria also,

Taxonametrics. *See numerical taxonomy.*

Taxon (pl. taxa). Used for the named taxonomic unit of any rank. For instance, family level taxon is Rosaceae, generic level taxon is *Rosa*. The organism contained within the rank e.g. genus, order or species can also be formed as taxon.

Taxonomy. Dealing with the study of the principles and practices of characterization and classification. This term is strictly applicable to study and description of variation in the natural world and subsequent compilation of classification. This term is loosely employed to include systematics.

TCA Cycle. *See Krebs' cycle.*

Teleutosorus (telium). Refers to a sorus in which teleutospores are formed.

Telemorphosis. The growing of a gametophyte into the clear area which is present between two strains of a heterothallic fungus grown in solid culture.

Teleutosorus. A group of teleutospores whose supporting hyphae, are forming a pustule on the surface of the host.

Teleutogonidium, Teleutospore. A thick-walled spore which consists of two or more cells. It is formed by a rust fungus towards the end of the growing season. They may remain dormant for some time and then undego germination giving one or more promycelia on which the basidiospores get formed.

Teleutostage. The stage in the life-history of a rust fungus when teleutospores have been formed.

Teliospore. *See teleutospore.*

Telium. *See teleutosorus.*

Telocentric. Said of a chromosome that is having its centromere at or very close to one end so that only one arm of chromosome becomes visible. *Compare* acrocentric, metacetnric.

Telome Theory. According to this theory there are certain plant organs which are derived from modified and reduced branch system and e.g., megaphylls are considered to be derived by flattening of a branch subsequent developing of mesophyll tissue (*webbing*) between branches.

Telomitic. Said of chromosomes which are attached to the fibres of the spindle by their ends.

Telophase. Used for the terminal stage of mitosis or meiosis during which nuclei get reverted to the resting stage.

Telosynapsis, Telosyndesis (Metasyndesis). Said of the end-to-end association of chromosomes in zygotene and pachytene.

Temperate Phage (See Lysogenic Phage). A bacteriophage not killing its host.

Temperate Phage. A DNA phage is not necessarily inducing lysogeny in an infected bacterial cell, instead, phage DNA is getting incorporated into the bacterial chromosome and replicating alongwith it. The bacterium thus infected is known as *lysogenic*.

Template RNA. *See RNA.*

Temporary Collenchyma. Said of collenchyma which is present in a young organ. It disappears as secondary thickening progresses.

Tendril. A stem, leaf, or part of a leaf which gets modified as a branched or unbranched filamentous structure. It is used by many climbers for attaching to a support by twining, or by adhesive terminal disks.

Tension Wood. *See reaction wood.*

Tentacle. One of the hairs on the leaf of an insectivorous plant, which is help ful in capturing insects and is producing enzymes which digest the prey.

Tent Pole. In certain gymnosperms, there occurs an extension of female gametophyte towards the pollen chamber as observed in *Ginkgo biloba* and also characteristic of many fossil genera.

Tepal. Individual unit of indistinct perianth in flower in which calyx and corolla are not differntiated as in most monocotyledonous plants. These are brightly coloured as in tulip.

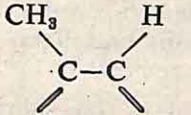
Teratology. The study of abnormal growth and malformations.

Terete. Used for the structure which is smooth, cylindrical and tapering *e.g.*, a grass stem.

Terminal Affinity. Used for the property by which chromosomes become held together end-to-end from diplotene till first metaphase of meiosis, or brought together in this way at metaphase.

Terminalization. Describing the expansion of the association of the two pairs of chromatids on one side of a chiasma at the expanse of that on the other side. It is so called since the resulting 'movement' of the chiasma takes place towards the ends of the chromosomes.

Terpenes. The usaturated hydrocarbons ($C_{10}H_{16}$) which are essential oils with straight-chain or ring-structure derived from isoprene.



Isoprene

Terra Rosa. A red soil which is associated with limestone. It is occurring in countries bordering the Mediterranean Sea.

Tertiary. A geological era about 70-1 million years ago.

Tertiary Wall, Tertiary Layer, Tertiary Thickening. Used for the depositing of wall thickening on the inner surface of a secondary cell-wall, tracheid, or vessel, generally in the form of rings or a loose spiral.

Tertiary Structure. Describing the structure of a protein where the polypeptide chain is bent sharply thereby forming a roughly spherical, three-dimensional mass.

Testa. The seed coal which is derived from the integuments. It is several layers thick and is protective in function.

Test Cross A cross which takes place between a double or multiple heterozygote and the corresponding double or multiple recessive. It finds use in the estimating linkage relationships to the behaviour.

Tetrad. (1) A group of 4 spores which are formed by meiosis within a spore mother cell.

(2) The paired chromosomes of meiosis, after each chromosome has undergone duplication itself, and the pair is visibly four-stranded.

Tetrad Analysis. The genetic analysis of four cells obtained from a meiotic division so as to gain information on the nature and extent of recombination. Such analysis is possible only in tetrad in which four cells are joined together.

Tetrad Division. The nuclear and cell divisions taking place when a spore mother cell undergoes division to give 4 spores.

Tetradynamous. Used for describing condition of androecium in which four long and two short stamens are present as in Cruciferae.

Tetramerous. Describing flower in which units of different whorls are in fours or multiples of four *e.g.*, in members of Cruciferae.

Tetraploid. An organism or cell which is having four times the haploid number of chromosomes *i.e.*, four sets of genome. Such a condition is obtained by fusion of two diploid gametes. *See also autopolyploidy, allopolyploidy.*

Tetrasomics. The zygote obtained by fusion of two gametes which are having some additional chromosome present in their genome. *See* aneuploidy.

Tetrasporangium. The sporangium of some red algae *e.g.*, *Polysiphonia* which is initially unicellular but then dividing meiotically to give four spores (*tetraspores*).

Tetrasporangium. Said of the sporangium of the tetrasporophyte of the red algae. Initially it is unicellular, but the nucleus undergoes division meiotically to give 4 tetraspores.

Tetraspore. The spore which is produced in tetrasporangium by meiosis in certain red algae (e.g. *Polysiphonia*) on terasporophytes. These spores have been arranged in tetrahedral manner in the tetrasporangium. They are boat-shaped having a trrıradiate mark on the inner surface. They are haploid, uninucleate and non-flagellate.

Tetrasporophyte. Said of the diploid phase in the life-cycle of the red algae. It produces tetraspores.

Tetraster, A complex mitotic figure which is formed in an ovum after polyspermy.

Thalamifloral. Used for a flower which is having all its members inserted separately on the receptacle, with the gynoecium superior.

Thalamium. Used for the hymenium of an apothecium.

Thalamus. The receptacle of a flower.

Thallophyta. Used for the most primitive division of the plant kingdom. Examples are the algae, fungi, lichens, and possibly the bacteria and myxomycetes. The plant body (*thallus*) is simple, being unicellular, multicellular, and even large, but is never differentiated into stem, leaf, and root. Asexual reproduction takes place by spores, and sexual reproduction by the fusion of gametes formed in sex-organs which consist essentially of single cells.

Thallospore.. An asexual spore of the fungi which is not having conidiophore, or one which does not get separated from the hypha or conidiophore producing it.

Thallus. *See Thallophyta*.

Termonasty. The response to general non-directional temperature stimulus.

Thermophile, Thermophillous, Thermophilic. Used for a plant which requires a high temperature for growth, or which can tolerate exposure to high temperatures.

Thermophilic Bacteria. Bacteria requiring a temperature from 45°C to 65°C for their development.

Thermophyte. A plant which grows in warm situations.

Thermoperiodism. Used for the response of plant to diurnal fluctuation in temperature and duration of exposure to these varying levels in daily and annual cycles. All morphological activities have been found to depend upon temperature levels during a 24 hour cycle and also vary in different times of the year. Growth, meristematic activity, differentiation, flowering, fruit formation, seed germination etc. are often affected by thermoperiodicity.

Thermophilic. Used for such microorganisms that naturally require high temperatures (45-65°C) for growth. Such organisms occur in hot springs and rotting vegetable matter.

Therophyte. An annual plant which passes the winter, or dry season as a seed.

Thigmotaxis. Used for the response of an organism to the stimulus of touch or contact.

Thigmotropism. *See thigmotaxis*.

Thorn. A leaf, part of a leaf, or shoot, which is having a vascular bundle, and ending in a hard, sharp point.

Thorn Forest. A type of transitional vegetation which has some similarities to savanna and semidesert vegetation, grading into tropical forests. These are found in Central and South America, Australia and Africa.

Thrum. *See heterostyly*.

Thylakoid. Any one layer making up the grana of chloroplast, consisting of a channel surrounded by a pigment having membrane.

Thyrse. A complex, densely branched inflorescence having individual branches as dichasia *e.g.*, in *Aesculus hippocastanum*.

Tiller. A shoot which gets developed from axillary or adventitious buds at the base of stem, often in response to injury of main stem. It is one of the characteristics of growth of grasses.

Timber Line (Waldgrenze). Defines more or less well defined region at high altitudes or latitudes beyond which there occurs no normal dense growth of trees. Trees growing between timber line and tree line are dwarfed and deformed and are known as 'elfin forest'.

Tinsel Flagellum. *See pantonematic flagellum.*

Tissue. A region having cells of the same type and carrying out the same function. They are associated in large numbers by cell-wall.

Tissue Culture. The growth of detached pieces of tissue in nutrient solutions under sterile conditions.

Tissue System. The whole tissues in a plant having the same function, whether or not they are in continuity, and whatever their position in the plant.

Toadstool. Used for the fruit body of the agarics, other than mushrooms.

Tomentose. Used for describing a surface densely covered with short hairs *e.g.*, leaves of *Verbascum pulverulentum.*

Tonoplast. The membrane separating the vacuolar sap from protoplasm in the cell, having same structure as that of plasma membrane and mediating transport between protoplast and vaculor sap.

Torus. 1. The receptacle of a flower 2. The thicker part of the cover of a bordered pit.

Totipotency. The capacity shown by certain types of isolated, differentiated plant cells for regenerating the whole plant.

Touchwood. Used for wood which is much decayed by fungal attack. It crumbles readily, and gets easily ignited by a spark when dry.

Toxin. Any poisonous substance which is of microbial origin. It stimulates the formation of antitoxins in the animal body. Many bacterial diseases are caused by exotoxins and endotoxins. There are several fungi which produce toxins. Toxins produced by *Aspergillus niger* are known as *afflotoxins*. In higher plants toxins are not much common e.g., ricin in castor oil brings about agglutination of red blood corpuscles.

Trabant. *See satellite.*

Trabacula. A bar-like structure which is extending across a lumen or lacuna. For example there are certain endodermal cells which elongate radially to form trabaculae in endodermis of stem of *Selaginella.* In some plants there are extensions of secondary wall thickening which are forming trabaculae across lumina of xylem tracheids.

Trace Element. An element which is required in very small amounts by a plant for healthy growth and development. Generally it is a metal which is involved in the structure of an enzyme complex.

Tracer. An isotope which is incorporated in into a compound of biological importance, so that it becomes possible to follow the passage of the isotope atoms through the physiological processes of the plant.

Tracheary Element. A water-conducting cell xylem *i.e.*, a vessel element or trachied. The secondary cell walls of the tracheary elements show various types of thickening (*see* illustration). Annular and spiral patterns of thickening allow further extension of the tracheary element and tend to be found in protoxylem. The other forms of thickening are seen in metaxylem. Although bryophytes do not possess xylem, some do possess water-conducting cells known as hydroids. Some consider these are also tracheary elements.

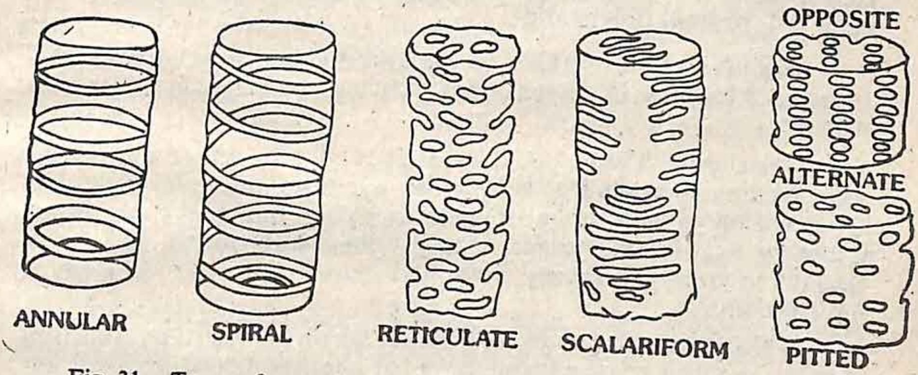


Fig. 31. Types of secondary wall thickening in tracheary elements.

Tracheid (E). A long narrow pipe-like, non-living cell with norrowed shut ends and thick walls, in touch with other vessels through the pits, present in wood, specially that of ever green trees, for giving support and transporting water.

Trama. In an agaric, the somewhat loose network of hyypae forming the middle part of a gill.

Transmission. Refers to the transfer of virus or a disease from infected plant to a healthy plant.

Transamination. Refers to the transfer of amino group to a keto group catalysed by transminases. It is important in amino acid metabolism.

Transcription. Refers to the process in protein synthesis in which complementary copy of nuclear genetic code is formed by synthesis of mRNA molecule,

Transaminase. An enzyme carrying out transamination

Transduction. The transfer of genetic material from an invaded and lysed bacterium to another bacterium by a bacteriophage.

Transect. A line or belt of vegetation which is selected for charting plants. It is done to observe changes in the composition of the vegetation across a particular area.

Transferase. Refers to any enzyme catalysing reactions in which a functional group is transferred from a donor to an acceptor molecule. Six classes of such enzymes are known including phosphotransferase or kinase, phosphate acyltransferase etc.

Transfer RAN (tRNA). Refers to a type of RNA molecule that is shaped like a clover leaf. It binds to amino acid in cytoplasm, then transfers the bound amino acid to the site of protein synthesis and finally leaves the attached amino acid at correct position by recognizing the site which is dictated by RNA codon and recognized by tRNA anticodon. Thus it is important in translation of genetic code into protein polypeptide.

Transformation. Refers to the introduction of genetic material from dead bacteria in suspension to living bacteria in same suspension.

Transfusion Tissue. A tissue that is lying on either side of the vascular bundle in the leaves of most gymnosperms. It represents an extension of the vascular bundle carrying out the function of lateral veins. It is composed of empty cells with pitted and occasionally internally thickened walls, and parenchymatous cells which have protein.

Transition. Refers to a mutation which is caused by substitution in the DNA of one purine base for another or one pyridine for another. Adenine and guanine could replace each other as can cytosine and thymine.

Transition Cell. A thin-walled cell at the end of a leaf which is representing the last of the phloem.

Transition Region. The portion of the axis of a young plant in which the change from root structure to stem structure takes place.

Transitional. Used for an inflorescence which has some recemose and some cymose characters.

Translation. Refers to the part of the process of protein synthesis in which there occurs decoding of the message of codons in mRNA and concurrent formation of polypetide chain based on the sequence of triplet codons It takes place on ribosomes in cytoplasm of cell and also involves tRNA. The process is highly endergonic and needs 4 ATP equivalents per amino acid residue. Four stages are recognised in the process : *activation*, *initiation*, *elongation*, and *termination*.

Translocation. (1) Refers to the movement of soluble organic food material etc. through tissue

(2) Refers to the transfer of part of a chromosome into a different part of a homologous or into a non-homologous chromosome.

Transmitting Tissue (conducting tissue). Refers to the specialized, thinwalled tissue that forms the central portion of the style in some angiosperms through which pollen tube grows down to the funiculus. It may take part in self incompatibility system.

Transpiration. Refers to the loss of water by evaporation from the plant surface, over 90 % of which takes place through stomata (*stomatal transpiration*) and about 5 % takes place directly from the surface of epidermal cells. Transpiration from the general surface of the plant body and not taking place through stomata is known as *cuticular transpiration*

Transpiratton Current. Transpiration Stream. Refers to the stream of water which passes through a plant from the roots to the leaves, whence it escapes, chiefly in the form of water vapour.

Transversion. Used for a mutation which is caused by substitution of a purine base for a pyrimidine base (or vice versa) in the DNA.

Trap Crop. Refers to any crop that is planted in or around another crop to attract pests away from the valuable crop. Trap crops are generally heavily treated with pesticides, burnt or ploughed in.

Tree. A tall, woody, perennial plant that is having a well-marked trunk with few or no branches persisting from the base.

Tree Ferns. Refer to some members of fern order Filicales that attain heights of 10m although secondary tissue is not clearly developed. In these species, the stem is strengthened by the bands of sclerenchyma.

Tree Line (Baumgrenze). Used for more or loss clearly defined region at high altitudes (subalpine/alpine boundary) or high latitudes (the taiga/tundra boundary) beyond which no trees grow.

Triassic. A geological period extending from 190 to 170 million years ago.

Tribe. A section of a family that consists of a number of related genera.

Trichoblast. (1) A colourless rod-like or granular particle. They surround the gullet in the Cryptomonadales.

(2) A branched multicelluar filament which is produced from a small trichoblast initial at the apex of the filament of the Ceramiales. The trichoblast may divide to ultimately form a surface layer of spermatogonia.

Trichogyne. A unicellular or multicellular organ projecting from a female sex-organ. It receives the male gamete or male nucleus before fertilization. It is found in some of the green and red algae, ascomycetes and lichens.

Trichome. (1) A hair.

(2) In the Cyanophyta, a single row of cells which with their sheath make up the filament.

Trichophyllous. Used for a plant of dry places which has the young stems and leaves protected from desiccation by a thick coating of hairs.

Trichothallic Growth. A type of growth of an algal filament, in which cell division is limited to a few (or 1) cells near or at the base of the filament.

Tricolpate. Refers to a pollen that is having three colpi and such pollens are common in dicotyledonous species.

Trifoliate. Used for describing a compound leaf that is having three leaflets arising from the same point *e.g.* in *Trifolium* and *Oxalis.*

Trihybrid. Refers to the organism that is heterozygous for three genes.

Trilete. Refers to the spore that bears triradiate scar.

Trimerous. Used for describing flowers in which number of units in each whorl is three or multiple of three. Such flowers are monocotyledons.

Tripinnate. Using for a pinnately compound leaf having, pinnately divided leaflets, which themselves are pinnately divided.

Triple Fusion. Refers to the union in the embryo-sac of the two polar nuclei and a male nucleus. It is the starting point for the development of the endosperm.

Triplet. (1) The three adjacent nucleotides which are necessary to code a single amino acid. It is the minimum number.

(2) One of three individuals resulting from the division of an ovum.

Triplet Code Hypothesis. Refers to the hypothesis which states that a genetic codon is having a sequence of three nucleotides. In living organisms, the shortest possible sequence of four bases that is necessary for specific coding of all the 20 types of animo acids constituting proteins is three since $4^3=64$ *i.e.*, number necessary to code all the 20 animo acids.

Triplex. A tetraploid zygote which is having three doses of any given dominant.

Triplex Strand. Used for a hypothetical three-stranded structure which is formed by two polynucleotide strands of DNA and a strand of coded RNA bases, the position of the latter being ascertained by the base-pairs on the DNA strands.

Triploid. Having three times the haploid number of chromosomes in the nucleus.

Triradiate Scar. Refers to a scar present on the surface of a spore that denotes the point at which it got joined to other three spores in the tetrad of four tetrahedrally arranged spores.

Trisomic. Used for an organism that is having an extra chromosome in addition to its normal complement *i.e.* 2n+1. Trisomic may be having extra chromosome which is simple copy of one of the chromosomes (*primary trisomic*) or an isochromosome (*secondary trisomic*) or may be including parts of two non-homologous chromosomes (*tertiary trisomic*).

Tristichous. Refers to a form of alternate leaf arrangement in which successive leaves arise at 120° around the circumference of stem thereby forming three vertical rows of leaves.

Trivalant. Said of the structure which is formed by temporary association of three homologous chromosomes in a triploid or trisomic organism seen between mid prophase I and late metaphase I of meiosis.

Tropane Alkaloids. Refer to a group of alkaloids which are derived from amino acid ornithine including hyoscyamine and its stereoisomer atropine (both Solananceous alkaloids), cocaine alkaloids etc.

Trophic Level. Refers to the rank of organisms in an ecosystem on the basis of the method by which organisms are deriving their organic food in the food chain and representing a step of energy transfer in the sequence of energy flow through the biotic component of ecosystem

Tropical Rain Forest. *See rain forest*.

Trophotropism. A reaction in a growing organ included by the chemical nature of the environment.

Tropic Curvature. A curvature of a plant organ which is caused by one-sided growth under the influence of a stimulus falling on the plant from one side.

Tropism. Used for response to a stimulus by a growth curvature, the direction of the curvature being ascertained by the direction from which the stimulus originates.

Tropophyte. Refers to a plant that has been adapted to survive in climate of alternating dry and wet seasons by having a resting phase during dry season.

True Fruit. A fruit whice is formed from the ovary.

Truffles. Refers to the members of order Tuberales of Discomycetes. They form underground ascospores which resemble tubers. They include about 35 genera and about 230 species, many of which are edible. Certain species occur under particular trees. *e.g.*, *Tuber melanosporum* under oaks and are considered to be mycorrhizal.

Tube Cell (tube nucleus). Used for one of the cells present in the microspore of gymnosperms. In *Cycus*, it enters haustorial pollen tube but its function is not known with certainly. In angiosperms, the cell at the tip of pollen tube that precedes generative nuclei is sometimes known as tube cell but more often is known as vegetative nucleus.

Tube Germination. Germination of a spore by forming a hypha (germ tube).

Tube Nucleus. Refers to the non-generative nucleus in a pollen-tube. It probably plays some role in regulating the development and behaviour of that organ.

Tuber. A swollen underground stem or root, which contains stored food, and acts as an organ of perennation and vegetative propagation.

Tuberculate (verrucose). Refers to the structure whose surface is covered with small watery projections *e.g.*, rind of ridge cucumber.

Tumour Inducing Principle. Refers to a plasmid carried by bacterium *Agrobacterium tumefaciens* that causes crown gall disease in plants. The plasmid is essential for converting normal tissue of host into tumour tissue which involves incorporation of plasmid into the plant genome. It is of interest to note that the tissue removed from crown gall tumours can grow in culture medium without adding auxin and cytokinin.

Tundra. Refers to a cold desert characterized by the scanty, xerophytic vegetation in which mosses and lichens are dominant.

Tunic. *See* exocarp.

Tunica. A coat, especially a thin, membrane which is present round the peridiole in most species of the Nidulariaceae.

Tunica-Corpus Theory. Refers to the theory about organization and development of apical meristem. According to this theory, meristematic region gets differented into an outer peripheral layer (or layers) called *tunica* and inner mass of cells called *corpus*.

Turgid. (1) Used for describing a cell which is distended, being well-supplied with water.

(2) Used for describing a young or soft plant member which is stiff or rigid due to the internal pressure arising from a plentiful supply of water,

Turgor. Refers the state of a cell when the cell-wall is stretched by an increase in the volume of the vacuole by the intake of water.

Turgor Potential: *See pressure potntial.*

Turgor Pressure. The hydrostatic pressure which is set up within a cell by the water present acting against the elasticity of the wall.

Turion. (1) A swallen perennating bud, which contains much stored food. It is formed by a number of water plants. It comes away from the parent, remains inert through the winter and gives rise to a new plant in the following spring.

(2) A scaly sucker or shoot which is arising from underground.

Tylose, Tylosis. Said of a balloon-like enlargement of the membrane of a pit in the wall of a vessel or tracheid, and a xylem parenchyma cell lying next to it. It protrudes and tends to block the cavity of the wood element.

Type Specimen. Refers to the original speciment(s) on which a discription of a new species etc. is made,

U

Ubiquinone. *See coenzy ne Q.*

UDP. Uridine diphosphate.

UDP. Uridine diphosphoglucose.

Ultrastructure (fine structure). The structural details of cells below the limit of resolution of light microscope. It is revealed only by electron microscope.

Ultramicrob. An agent of obscure nature which may cause disease in organisms, but too small to be seen with an ordinary light-microscope.

Umbel. A sort of raceme in which the chief stem makes no growth between the flowers so that they come from about the same point, forming a flat or arched flower head with the first-formed flowers on the outside, the latest in the middle.

Umbellate. Used for having the characters of an umbel.

Umbilicate. Used for peltate and depressed in the centre.

Undulipodia. The collective term which is used for flagella and cilia because of similar (9+2) structure in both.

Unifoliolate. **(Of leaves)** Compound but of which all but one of the last undergo no development so that it appears to be simple.

Unijugate. Used for a compound leaf which has one pair of leaflats.

Unilateral. 1. Coming from one side or direction only. 2. A raceme in which all the flowers turned to one side.

Unilocular. Having one nucleus.

Unilocular Sporangium. Used for a type of sporangium in brown algae *Laminaria Ectocrpus* etc. which has only one locule and is not divided into compartments. *Compare* plurilocular sporangium.

Unisexual. 1. Of one sex only, male or female, not the two together. 2. Having the male and female parts in separate flowers..

Unit Character. Used for one whose differences from an alternative gets transmitted as a unit in heredity. These are independent characters which could be traced in each generarion, and assorted and distributed by the laws of chance.

Universal Veil. The membrane enclosing the fruiting body in many basidiomycete fungi. It ruptures by elongation of stalk, and the remnants are forming the *volva* at the base of the stalk and flecks of tissue on the upper surface of the cap e.g., in *Agaricus*.

Unsymmetrical. Used for a flower in which all the parts are not regular.

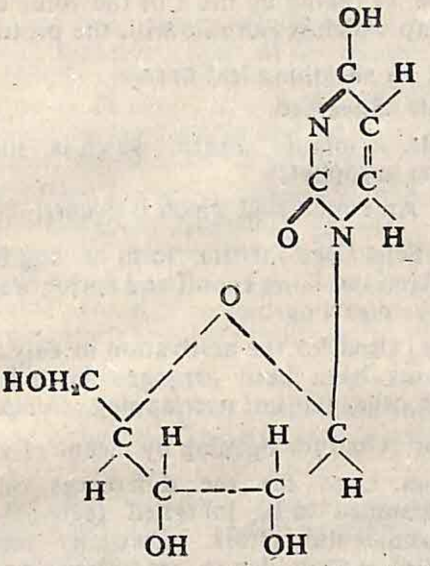
Uredium. ***See uredospore.***

Uredosorus. **(uredium)** : The sorus in which uredospores get clustered. Formed on the host plant which gets infected by certain rusts e.g., *Puccinia*. Their characteristic shape, colour etc. are of diagnostic value.

Uredospore **(urediospore).** A dikaryotic spore which is formed in a sorus (uredosorus) by certain rust fungi e.g., *Puccinia graminis* on the infected host plant. When the spores are released, these spores again infect another healthy plant thereby spreading the diseases in the same growing season.

Urediostage. The phase in the life-history of a rust fungus if uredospores are formed.

Uridine=Ribose-3-Uracil. A nucleoside which is formed from ribose and uracil.



Uridine Diphosphate (UDP). *See uridine diphosphoglucose.*

Uridine Diphosphoglucose (UDPG). In carbohydrate metabolism glucose-1 phosphate is converted to UDPG in the presence of UDP.

Urn. The capsule of a moss.

Urticle. A small fruit in which the pricarp is free from the seed.

Utricle. 1. A little bag-like hallow part e.g., those seen on the leaves of some water plants in which smaller animals are taken prisoner. 2. A dry, generally, one-seeded fruit is a thin, dry, hollow cover or such a cover itself.

Uva. A berry formed from a superior orary, such as that from which most wine is made.

V

Vacuolation. The process of uptaking of large amount of water into the cell vacuole by osmosis during the process of cell elongation.

Vacuole. A fluid-filled space in a cell. In many plant cells, a single vacuole, is taking up most of the volume of the cell. It contains a cell-sap which is isotonic with the protoplasm.

Vagina. A sheathing leaf-base.

Vaginate. Sheathed.

Vaginule. A minute sheath, which is surrounding the base of the seta in the bryophytes.

Valine. An amino acid which is occurring in proteins.

Valley Bog. Used for the form of bog in regions like glens of western Scotland receiving runoff and spring water from surrounding mountains. *See also* bog.

Valvate. Used for the aestivation in calyx and corolla in which individual units have been arranged in circle, their edges are just touching each other but not overlapping. *Compare* imbricate.

Valvular. Used for opening by means of values.

Variation. Used for the differences of characters between individuals assumed to be inherited (genetic) and those due to the effect of environmental factors. In sexually reproducing organisms, genetic variance occurs due to recombination although its ultimate source is mutation and in addition to this, environmental variation may occur due to various physical and biotic factors and exhibits the *phenotypic plasticity* of the organism. Variation may occur in kind of characters (*qualitative variation*) or in the degree of characters (*quantitative variation*).

Variegation. Used for irregular variation in colour of a plant organ, *e.g.* leaves or flowers due to the suppression of normal pigment development. This may occur due to the action of a marginal genotype, somatic mutation, or infection.

Variety. A group of plants or animals forming part of a species but marked off as a separated division of it by having in common certain preperties which are different from the type but developments from it and which are regularly handed on to their offspring when produced by breeding with one another.

Varve. The layer of sediment deposited in a glacial lake by waters which are melted in summers and spring. Varves were formed in Pleistocene when ice was retreating.

Varve Dating. The method used for determining the age of a sediment and the fossils it has. In a varve (*See* varve), the particles are much coarser than the particle deposited later in the year thus annual layers in the sediment would be distinguised. Thus by counting varves, it is possible to establish the chronology of sediment.

Vascular. Used for vessels which conduct fluids.

Vascular Bundle. Stands for one of a number of 'strands of primary vasular tissue having both xylem and pholem. Vascular bundles together comprise of vascular system of the plant. Vascular bundles may be *radial*, having xylem and phloem at different radii e,g., in roots *conjoint*, *collateral*, *bicollateral*, *concentric* etc, in stems. If there is fascicular cambium between xylem and phloem, bundle is called *open* and if it is absent, bundles are called *closed*.

Vascular Cambium. Used for lateral meristem found in those vascular plants which are undergoing secondary growth. It forms secondary xylem and secondary phloem mostly by periclinal cell divisions. It is having *fusiform initials* that form axial system and *ray initials* that form radial system of secondary tissues. *See also* fasicular cambium, cambium interfascicular cambium.

Vascular Cylinder. *See stele.*

Vascular Plants. Describing any plant containing vasular conducting tissue, *i.e.*, xylem and phloem. These include pteridophytes, gymnosperms and angiosperms.

Vascular System. The continuous network of vascular tissue, xylem and phloem, that is forming the conducting system throughout a plant body.

Vascular Transition. The transition of arrangement of vascular tissue from that of the root to that of stem which is seen in the transition region (See *transition region*) so as to maintain the continuity of vascular tissue throughout the plant.

Vector. The animal carrying a pathogen from one organism to another e.g., aphids, white flies and leaf hoppers. Insect vectors transmit viral and mycoplasma diseases. Mites and nematodes are also vectors of viral diseases.

Vegetation. All the plants grown in a given area.

Vegetative Nucleus (vegetative cell). The large nucleus which is formed within the pollen grain of angiosperms alongwith one or two smaller generative nuclei. It gets migrated to the tip of pollen tube on pollen germination and may be called tube nucleus. It may probably be controlling the growth and development of pollen tube disintegrates when pollen tube penetrates the nucellus.

Vegetative Reproduction. Vegetative Multiplication. Vegetative Propagation. Asexual reproduction taking place by detachment of part of the plant which is then developed into a complete plant.

Veil, Velum. (1) An evanescent membrance present over an apothecium.

(2) A sheath of hyphase which is forming a complete membrane over the fruit-body of an agaric.

Vein. A single vascular bundle or a group of closely associated bundles in a leaf. In a leaf vein, xylem is almost always present on adaxial side whereas phloem is present towards abaxial side. Sometimes vein has been surrounded by a bundle sheath of collenchyma, sclerencyma or parenchyma which may be extending to the leaf epidermis. The pattern of veins in a leaf is known as *venation*.

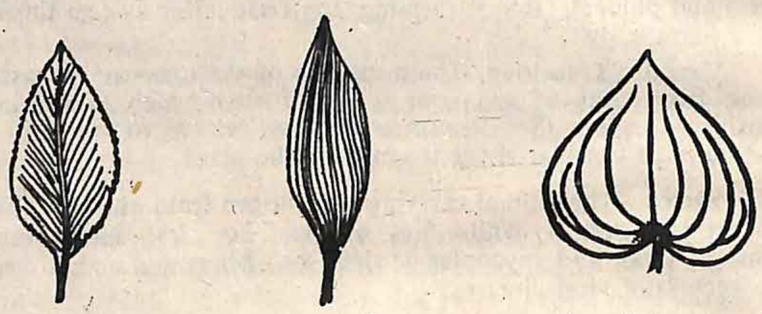
Veination. See *venation*.

Velamen. Water absorbing tissue which is present on the outside of aerial roots in certain plants, *e.g.* epiphytic orchids. It consists of several layers of dead cells often with spirally thickened and perforated walls, which soak up water running over it.

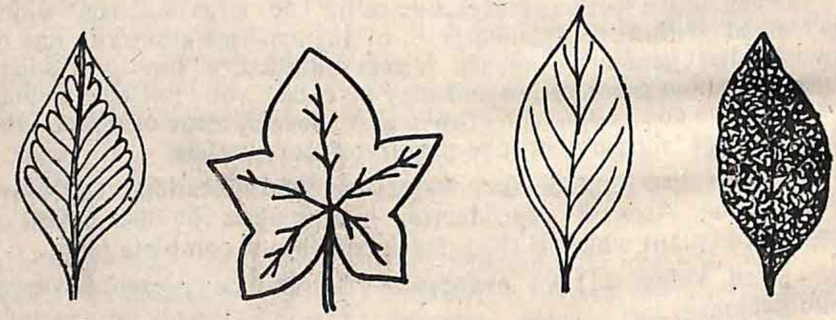
Velum (Veil). A membranous outgrowth from the base of a leaf of Isoetes. It is covering or partly covering the sporangium.

Velutinous. Covered thickly with very short, soft, upright hairs, very smooth and soft to the touch.

Venation (veination). The pattern of veins in a leaf as observed from its upper surface or lower surface. It is of diagnostic value. *See also* actinodromous, brochidodromous, campylodromous, craspedromous, eucamptodromous, parallelodromous, reticulodromous.



Craspedromous Parallelodromous Campylodromous



Brochidodromous Actinodromous Eucamptodromous Reticulodromous

Fig. 32 Some common forms of leaf reenation.

Venter. The swollen flask-shaped base of an archegonium which is having the female gamete.

Ventral. 1. In thallose plants flattened like a leaf, the lower surface that is towards the ground or substrate. 2. In lateral organs, the adaxial side. *Compare* dorsal. *See also* adaxial.

Ventral Canal Cell. One of the products which is formed alongwith egg cell when the primary ventral cell of an archegonium undergoes division. It lacks cell wall and lies at the base of neck. At maturity of archeogonium, it becomes mucilaginous and may produce chemicals to attract the male gamete.

Ventral Placentation. *See marginal placentation.*

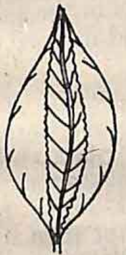
Ventral Suture. The line of fusion at which the margins of megasporophylls join to form characteristic tubular shape of ovary as happened in angiosperms. Dehiscene takes place along these sutures at fruit ripening.

Vernalin. A hypothetical plant growth substance assumed to be formed in meristematic regions of a plant subjected to cold and possibly taking part in vernalization.

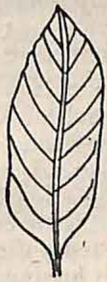
Vernalization. Said of the treatment of plant with low temperatures in the initial stages of seedling development. This treatment induces a rapid development towards a physiologically order condition thereby shortening the interval between sowing and flowering.

Vernation. The manner in which the leaves have been arranged in the bud. Many types of vernation are recognised in Fig. 33.

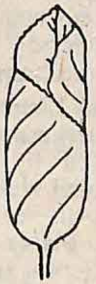
Verruca. A granular or wart-like outgrowth present on a thallus.



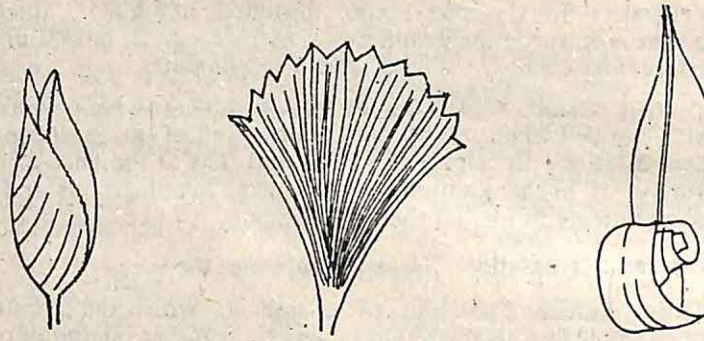
Involucre



Revulate



Convulate



Conduplicate Plicate Circinate

Fig. 33 Types of vernation.

Versatile. In anther which gets attached at the tip of the filament, by a small area on its dorsal side, so that it would turn freely in the wind thereby helping the dispersal of the pollen.

Verticillaster. A kind of inflorescence looking like a dense whorl of flowers. Actually it is a combination of two crowded dichiasal cymes, one at each side of the stem.

Vesicle. Used for a cavity within the cytoplasm which is surrounded by a membrane. It may be of any shape like tubular spherical, discoid, ovoid etc., It may contain particles e.g., endocytotic particles of fluids e.g., secretory products of golgi bodies. The surrounding membrane separates its contents from the cytoplasm.

Vessel. A non-living of the element of the xylem. It is made up of a tube-like series of cells arranged end-to-end, running parallel to the long axis of the organ in which it lies, and in communication with adjacent elements by means of numerous pits in the side-walls. Its main function is the conduction of water and mineral salts. It also gives mechanical support.

Vessel Element. The tracheary cell which is present in xylem of some ferns,most angiosperms and order Gnetales of gymnosperms characterised by the presence of a perforation plate, a lignified secondary cell wall and lacking a living protoplast at maturity. These elements form vessels in which their end walls break down to form perforation plates. Vessel elements are usually shorter than trachieds and are different from them in having perforation plates and different types of wall pitting,

Vibrio. Any bacterium that is comma-shaped. *See bacillus, coccus, spirillum.*

Vicariance. Means the splitting up of an original biota into several isolated biotas (vicariants) by past geological or climatic events. Each vicariant then develops independently with evolution of different species.

Villous. Stands for describing anything which has shaggy appearance due to coverage of long, soft, curly trichomes.

Virescent. An abnormal green condition which is sometimes accompanied by the development of small, crowded leaf-like structurs, due to the attack of a parasite or other disease.

Virion. Stands for inert phase of a virus outside the cell which is consising of a piece of DNA (or RNA) surrounded by a protein coat.

Viroid. An extermely small infectious agent that consists of mainly RNA with no enclosing coat or capsid. These are isolated from various plants in which they undergo replication and result characteristic disease symptoms. Examples are potato spindle tuber viroid, hop stunt viroid, avocado sun-blotch viroid etc.

Virulence. (1) The capacity of a parasite for causing disease.

(2) The degree or measurement of pathogenicity.

Virus. A small infectious agent whose reproduction in the cell and transmission by natural infection gives characteristic reactions of cells and individuals. Outside the host cell a virus consists of DNA of RNA surrounded by a protein shell.

Vitamin. Any compound that is needed in trace amounts for normal functioning of an organism. It is not synthesized by some heterotrophs and they have to obtain it from some outside source through their food. A number of vitamins have been reported, *e.g.*, vitamin A, B, C, D, E, K.

Vitamin A. An isoprenoid compound whose deficiency results in night blindness. It is not present in plants but carotene pigments if ingested get cleaved into two molecules of vitamin A.

Vitamin B_1. *See thiamin.*

Vitamin B_2. *See riboflavin.*

Vitamin B_6. *See pyridoxin.*

Vitamin B_{12}. *See cyanocobalamin.*

Vitamin C. *See ascorbic acid.*

Vitamin E. *See tocopherol.*

Vitamin K. A fat soluble quinone which occurs in most plants and many micro-organisms. It plays a vital role in the transfer of electrons from photosystem I to photosystem II in photosynthesis. Its deficiency in animals affects the normal blood-clotting mechanism.

Vitta. (1) A stripe.

(2) A resin or oil canal often found in the pericarps of some fruits of plants in Umbelliferae.

Viviparous. (1) Used for plants which produce bulbils or young plants, instead of and in place of flowers.

(2) Used for a seed which germinates before it gets detached from the parent plant.

Volunteer. A crop which grows from unplanted seeds, *e.g.* seed shed by the previous crop.

Volutin Granules. (1) Granular cytoplasmic inclusions that stain intensely with basic dyes. They contribute to the formation of chromatin.

(2) Used for stored food substances in fungi, especially yeasts.

Volva. A sheath of hyphae which encloses the whole of the fruit-body of some agaric. It gets ruptured as the fruit-body enlarges and sometimes remains as a cup or pouch around the base of the stipe.

W

Waldgrenze. *See* timber line.

Wallace Effect. The idea postulated by A.R. Wallace that the reproductive barriers may be developing within a species and subsequently improved by selection., The intermediate phenotypes between optimum phenotopes (favoured by selection) have been found to be less suited in the particular environments of the areas and will get eliminated by selection. Hence, hybrids between optimum species become disadvantageous and hybridization shall be selected against.

Wall Pressure. The force which is exerted by cell wall on the cell contents. It is equal and opposite to the turgour pressure.

Warburg Effect. Used for the inhibition of carbon dioxide assimilation and photosynthesis by atmospheric oxygen given by O. Warburg in 1920. Later it had been found to be due to photorespiration.

Wart. A small blunt-tipped rounded up growth caused by a fungus disease.

Water Balance. The relation between the water taken in by a plant and the water given out by it.

Water Bloom, Water Flower. Development of large masses of algae, mostly Myxophyceae suddenly on bodies of fresh water.

Water Culture. An experimental set up for determining the mineral requirement of a plant. The plant is made to grow with its roots dipping in solutions of known composition.

Water Moulds. Used for members of order Saprolegniales of Oomycetes having about 32 genera and 240 species which are aquatic, mainly saprophytic fungi and often with diplanetic zoospores. Some act as parasites on fish *e.g., Saprolegnia parasitica* which often attacks salmon and goldfish.

Water Potential. Symbol ψ. The potential which is responsible for movement of water molecules from one place to another place. As water potential of pure water at normal temporature and pressure is considered to be zero and addition of solute lowers the water potential, it means that the water potential of a solution is always negative. Water tends to move from high water potential towards the lower water potential. In an osmotic system, water potential is given as follows :

'water potential (ψ) = osmotic potential (ψo) + matric potential (ψm) + pressure potential (ψp).

The term 'water potential' has now replaced the osmotic pressure. It differs from osmotic pressure in taking capillary and imbibitional forces into account.

Wax. A mixture of esters of higher fatty acids with higher monohydric alcohols or sterols. It may also have odd-carbon alkanes, long, chain monoketones, β-hydroxyketones and secretory alcohols. These are important constituents of waxy cuticle which is covering the plant organs and are manufactured as oil droplets in epidermal cells from where they get migrated to the outer surface of the plant via tiny canalculi in cell wall and crystallize as rods and platelets. the main function of wax is to maintain water balance.

Weed. Any wild plant of no use to man which makes its way into farm fields and gardens where it is not desired. *See also long*.

Weed Killer. *See herbicides.*

Weight. A differential value which has been assigned for estimating a quantity, relative to other estimates of the same quantity, for the purpose of combining the estimates. Generally its invariance or amount of information has been taken as the weight for each estimate of a series.

Weighted Mean. A mean obtained if different classes of observations or quantities give difierent weights in calculation.

Weismannism. The theory postulated by A. Weismann in 1886. It postulated the continuity of germ plasm and opposed the idea of inheritance of acquired characteristics. The body of organism is known as *soma* and the reproductive cells the *germ plasm*. Only germ plasms are involved in the inheritance of characteristics.

Weismann postulated that germ plasm was set aside during early development and was not influenced by subsequent changes in the soma.

Wet Rot. A plant disease which gets characterized by disintegration of tissues and release of cell fluids *e.g* , Brown rot of stored fruits like apples and plums is caused by members of *Sclerotinia* and wet rot of timber by various fungi such as *Contophora puteana* and *Poria vaillantii.*

Wild (of a plant or animal). Not cultivated or domesticated being of a sort produced without the help or care of man, living, having growth in natural conditions.

Whorl. Used for the arrangmeut of organs in such a way that they arise from another organ at a common level.

Wilt (of a plant, leaf or stem). Become soft and undergo a stopping of growth because the loss of water is not made up by intake, as in very dry weather.

Wilting Coefficient. The percentage of water present in the earth when plants rested in it undergo wilting.

Wilting Point. The pF value if the soil cannot supply water repidly enough for making up the losses by transpiration.

Wind Dispersal. The occurring of dispersal of spores, seeds and fruits by wind.

Wind Pollination. The conveyance of pollen from anthers to stigmas by wind. *See anemophily.*

Wing. (1) One of the lateral petals in the Papilionaceae.

(2) A flattened outgrowth from a fruit or seed which increases the area without increasing the weight. It takes part in wind-dispersal.

(3) The downwardly continuing base of a decurrent leaf.

Winter Annual. A plant living for a short duration. It grows, and sets its seeds in the colder parts of the year, dies, and survives the rest of the year as seed.

Winter-Green Plants. Small plants retaining their green leaves throughout the winter.

Witches Broom. A dense tuft of weak branches which is formed on a woody plant attacked by a parasite.

Wood. Xylem which is made chiefly of compounds or lignin and cellulose mixed with some inorganic substances.

Wood Fibre. A thick-walled elongated dead element occurring in wood. It gets developed by the elongation and lignification of the wall of a single cell. It is different from a tracheid in its thicker wall, and general inability for conducting water.

Wort. A liquid made from malt which is used in making cultures of bacteria.

Wound Cork. A layer of cork cambium and cork which is formed below and around wounds. It heals the damage, and does not allow the entry of parasites into the plant.

Wound Hormone. A substance formed in wounded tissue, which may affect the subsequent development of parts of the plant.

Wound Parasite. A parasite which can only enter into the body of a plant through a wound.

Wound Tissue. A pad of parenchymatous cells which are formed by a cambium after wounding. It may result in the formation of groups of meristematic cells from roots and buds from.

Wound Wood. A mass of parenchymatous cells which are formed at a wounded surface.

Wracks. Used for members of order Fucales of brown algae (Phaeophyta). They are solely marine and consist of a large proportion of the vegetation of coastol littoral zone. Thallus is parenchymatous and gets modified variously. Reproduction is cogamous and gemetangia get developed in specialized conceptacles. The life-cycle of plants has been diplontic.

X

Xanthein. A yellow pigment which is sometimes present in cell sap.

Xanthophyll. $C_{40}H_{56}O_2$. A yellow pigment which is present in plastids. It is found along with chlorophyll in chloroplasts and occurs in other chromoplasts. It absorbs light at frequencies where absorption by chlorophylls is poor and transfer absorbed energy to the chlorophylls.

X Body. An inclusion in a plant cell which is suffering from a virus disease.

X Chromosome. A heterochromosome which is associated with the determination of sex, and sometimes occurring alone.

Xenia. In cross fertilisation the effect of the pollen on the form, colour, etc. of fruit or seed produced from it so that properties of the male are seen in the first stage of development and not, as normally, only in the plant produced. For example, in maize, the endosperm may show a variety of colours depending on the origin of pollen fertilising the female.

Xenogamy. The pollination of a flower from a flower of the same species, but another plant.

Xerarch Succession. Describing succession in xeric condition which leads to the formation of xerosere and ultimately results in stablization of the area from extreme condition of water deficiency.

Xeric. Describing condition of habitat which is characterized by deficiency of water (*physical dryness* or *physiological dryness*) high temperature and strong sunlight as in deserts.

Xeric Environment. An environment in which the soil is having very little water, and the atmospheric conditions result in the rapid loss of water from plants.

Xeromorphic. Used for plants which are protected from loss of water by unusual morphological characteristics, *e.g.* thick cuticle.

Xeromorphy. Used for morphological characters which help in the reduction of water-loss.

Xerophyte. A plant which can survive when the water supply is scanty or there is physiological drought. Xerophytes have been classified on the basis of their method of surviving in dryness into *drought escaping, drought enduring and drought resistant xerophytes*. On the basis of their stem and leaf morphology, they have been classified into *microphyllous, sclerophyllous, succulent, malacophyllous* and *rolling xerophytes*.

Xerosere. The set of communities which get formed by xerarch succession in xeric habitat ultimately lead to the establishment of climax in the area through stabilization from extreme conditions.

Xylan. A polysaccharide which has xylose as major monosaccharide subunit. It is abundant component of hemicellulose. Dominant homocellulose in monocotyledons is an arabinoxylan which has arabinose sidechains attached to xylan backbone.

Xylem (wood). A type of vascular tissue which is used mainly to translocate water and solutes. It has vessels, tracheids, fibre tracheids, libriform fibres and parenchyma cells. All these types of cells may not be present in a wood. Anatomy of xylem is important in taxonomy. Xylem occurs in association with phloem forming the vascular bundle.

Xylem Fibre. The fibre cell which is found in xylem tissue. *See* fibre.

Xylem Parenchyma. The parenchyma tissue which occurs in the xylem. *See also* ray initial, ray.

Xylocarp. A hard wood-like fruit.

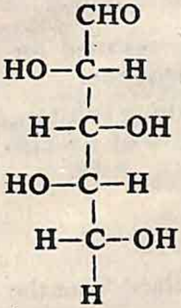
Xylochrome. A mixed coluring substance which is produced by wood cells before their death and giving its dark colour to heartwood.

Xylogen. Xylem in the process of development.

Xylology. The science of the structure of wood.

Xylometer. An instrument for measuring the density of wood.

Xylose (wood sugar). An aldopentose sugar which occurs widely in plants particularly in woody tissues, occurring mainly in its polymerized form xylan. It also occurs as a constituent of rare polysaccharide primeverose.



$$\begin{array}{c}\mathrm{CHO}\\ |\\ \mathrm{HO{-}C{-}H}\\ |\\ \mathrm{H{-}C{-}OH}\\ |\\ \mathrm{HO{-}C{-}H}\\ |\\ \mathrm{H{-}C{-}OH}\\ |\\ \mathrm{H}\end{array}$$

Y

Y Chromosome. The Sex-chromosome which is present only in the heterogametic sex, generally smaller than the X-chromosome and with a much smaller number of genes and having the opposite effect to the X-chromosome, all offspring produced by the uniting of Y-gametes with X-gametes being of the Y-sex.

Yeasts. Widely distributed unicellular fungi. They belong mainly to the Ascomycetes, which multiply typically by a budding process. The brewing and baking industries depend upon capacity of yeasts to secrete enzymes which convert sugars into alcohol and carbon dioxide. Yeasts are also used commercially as a source of proteins and vitamins.

Yellows. A term applicable to plant diseases which are characterized by yellowing of leaves and stunting. It may be brought about by a virus, fungus, insect, or toxin.

Yellow Earths. A general term applicable to a group of soils in the tropics, sub-tropics, and warm-temperate regions. The yellow colour is due to a high degree of hydration of the ferric oxide.

Yellow Snow. Snow becomes yellow by the growth on it of certain algae ; generally seen in the Alps antarctic regions.

Z

Z Chromosome. Sometimes used for the Y chromosome, if the female is in the heterogametic sex.

Zeatin. A growth promoting substance which was first isolated from maize kernels. A derivative of adenine. [6-(4-Hydroxy-3-methyl but-2-enyl) amino purine].

Zeaxanthol. *See lutein.*

Zecanin. A glutelin protein.

Zein. A prolamine obtained from the American Indian areas, zea mays.

Zeugite. A cell in which nuclear fusion takes place.

Zoid. Zoospore.

Zoidiophilous. Pollinated by animals.

Zonal Soil. A broad group of soils which is found in one of the main climatic regions of the world.

Zonate. Used for tetraspores which are formed in a row of 4 and not in a tetrahedral group.

Zonation. (1) The formation of bands of different colour on the surface of a plant.

(2) The formation, by fungi in culture, of a concentric band of colour, texture, abundance of spores etc.

(3) The distribution of vegetation in bands, each is having its characteristic dominant species.

(4) A stage in the development of an oogonium in which the contents have been arranged in two or more well-marked zones.

Zone. A band of colour, hairs etc. which are on the surface.

Zone Lines. Narrow dark-brown or black lines in decaying wood, which are generally caused by fungi.

Zoobiotic. A parasite which is living in association with an animal.

Zoochorous. Said of spores or seeds which get dispersed by animals.

Zoogamite. A motile gamete.

Zoogloea. A mucilaginous mass of bacteria which are embedded in a slimy material derived from the swollen cell-walls.

Zoogonium=Zoospore.

Zoophily. When pollinated by animals.

Zoosporangium. A sporangium producing zoospores ; present in certain fungi and algae.

Zoospore (**swarm-spore**). Naked spore which is produced within a sporangium (zoosporangium), motile by one, two, or many flagella ; present in some members of phycomycete fungi and green and brown algae.

Zygomorphic. Divisible in half by one longitudinal plane only.

Zygophase. The diploid phase in a life-history.

Zygophore. A mycelial branch which is bearing a gametangium.

Zygospore. Thick-walled resting spore which is a product of sexual reproduction by fusion of contents of two similar gametangia ; occurs in a group of phycomycete fungi, Zygomycetes, and in an order of green algae, Conjugales. Also employed for product of fusion of motile isogametes, *e.g.* in *Chlamydomonas*.

Zygosporophore. The suspensor of the Zygomycetes.

Zygote. The fertilized ovum, before it undergoes further cleavage.

Zygotene. Stage in prophase of first division of meiosis which is following leptotene, in which pairing (synapsis) of homologous chromosomes takes place with formation of bivalents.

Zygotic Meiosis. A meiosis taking place at the first two divisions of the nucleus resulting from gametic union.

Zygotic Number. The diploid chromosome number.

Zygotropism. The curvature of the gametophore of one strain of a fungus towards one of an opposite strain.

Zymase. Enzyme system of yeast which brings about fermentation of hexose sugars into alcohol and carbon dioxide.

Zymogen. Inactive form of an enzyme which is secreted by a cell and converted to activity usually by excision of a polypeptide. *See Trypsinogen.*

Zymohexose. The enzyme catalysing the splitting of hexose diphosphase to triose phosphate.

Dictionary of Biology	**Reeta Rani**	35
——— : Zoology	**Kiran Narang**	35
——— : Science	**Mahender Yadav**	35
——— : Geography	**M.S. Rao**	35
——— : Physics	**Aman Rao**	35
——— : Botany	**Madhu Arora**	35
——— : Computer	**Madan L. Narang**	35
——— : Geology	**M. Chhatwal**	35
——— : Environment	**Gurdeep Raj**	35
——— : Agriculture	**Gurdeep Chhatwal**	35
——— : Electronics	**V.K. Puri, P. Chand**	35
——— : Chemistry	**R.K. Kaushik, M.S. Yadav**	35
——— : Mathematics	**Sudhir Kumar**	35
——— : Technical Terms	**Shalini Rani**	35
——— : Economics	**C.S. Nagpal**	35
——— : Commerce	**O.P. Gupta, P.N. Abrol**	35
——— : Psychology	**Bhatia**	35
——— : Sociology	**B. Bhushan**	35
——— : Education	**Taneja**	35

Rs. 35

Anmol Publications
4378/4B, Ansari Road, Murari Lal Street
New Delhi-110002
Phone : 261597